RB-MTX

Preliminary User Manual

GSM/LTE

english version

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1 Package

1.1 Box

Original box of the product is shown in the picture below.

We can find product sticker on the box. It matches modems sticker that is placed on the device. This proves that your modem is original product. More information about stickers in chapter Product sticker.

1.2 Complete package contents

Complete package contains:

A) RB-MTX modem
B) Antenna GSM (via SMA)
C) Power supply adapter

1.3 Modem version

There are many ways to upgrade your RB-MTX modem. List below shows typical configuration and different combinations (versions) of this terminal.

Option	Typical	Option
Power supply	6...30V	5V
CPU	LPC3130, ARM9 180MHz	LPC3141, ARM9 270MHz
Memory	32MB RAM, 256MB MicroSD card (part used for Linux system, the size of SD card can be changed in the future)	NAND FLASH or DATAFLASH
RS232	Systems console (if CAN, then RTS/CTS unavailable)	RS485
I/O connectors	-	4 digital inputs, 4 digital outputs, ADC output, 2 analog inputs, I^2C, CAN interface, 3.3V output power supply, audio I/O, miniUSB 2.0 (only without WiFi modem)
Connection	GPRS or EDGE	UMTS or CDMA
SIM	Extractable	Built-in
Dual SIM	-	Option unavailable in CDMA version
Audio codec	-	Mono microphone. Stereo input LINE IN, Stereo output LINE OUT, or Speaker output SPK OUT
LAN	Ethernet 10/100Mbps	WiFi modem (only without miniUSB)

Modem port configuration depends on central module used. Available modules with described interfaces are shown in the table below.

	G24	H24	CDMA	HE910
USB	/dev/ttyACM0	/dev/ttyACM0 & /dev/ttyUSB0	/dev/ttyUSB0	/dev/ttyACM0 & /dev/ttyACM3
UART /dev/ttyS1	Modem info **or** Not refer	Modem info **or** GPS	Not refer	Not refer

2 General presentation

2.1 Front panel

2.2 Back panel

2.3 External connections

2.3.1 Interfaces and connectors

2.3.1.1 GSM antenna connector

SMA antenna connector placed on front panel is used to connect external GSM. To establish connection with GSM network an external antenna must be used. Type of antenna depends on GSM coverage. In good circumstances (level of received signal is high) use antenna which is attached in the package. If range of GSM is low or none, an outdoor directional/omnidirectional or indoor (for instance in place where GSM range is sufficient) antenna should be used.

Note: *If there is no antenna connected to SMA connector, the connection with GSM network is impossible.*

2.3.1.2 Modem serial port, either full RS232/RS485

Serial RS232/RS485 (through RJ-45 connector) is placed on front panel of modem and it can be configured for special use as an option for customer.

version			
signal RS232	signal RS485	RB-MTX	PC RS232
		RJ45	DB9F
nc	RT	1	nu
nc	nc	2	nu
(RXD)	RT(-)	3	nu
GND	GND	4	5
TXD	RX/TX+	5	2
RXD	RX/TX-	6	3
RTS	nc	7	8
CTS	nc	8	7
RT – terminator			

RB-MTX ↔ PC

	RB-MTX	PC RS232	
	RJ45	DB9F	
1	NC	NC	1
2	NC		2
3	NC		3
4		NC	4
5			5
6		NC	6
7			7
8			8
		NC	9

OR

	RB-MTX	PC RS232	
	RJ45	DB9F	
1	NC	NC	1
2	NC		2
3	NC	+++++	3
4	+++++	NC	4
5		+++++	5
6	+++++	NC	6
7		+++++	7
8	+++++		8
		NC	9

RS485 line termination

In case a long RS485 line, the line should be terminated on both ends. It can be realized by using an external terminator or by RT signals short-circuit (pins 1 and 3 of RJ45 connector for RS485 device option). The build-in terminator assumes 120Ω line impedance.

2.3.1.3 RJ-45 connector

RJ-45 connector is placed on front panel of RB-MTX modem and used for communication with PC or laptop to plug cable for Ethernet. In order to start configuration pages of modem plug UTP cable between RJ-45 of modem and RJ-45 of your computer. Configuration pages are available in the web browser under IP address specified on the modem (default address is 192.168.1.234).

2.3.1.4 Power supply connector

In the RB-MTX modem power supply 6V..30V care must be taken to ensure "clean" power supply input and especially to avoid short transients on power supply lines originating from inductive load switching. Otherwise internal module (G24, H24 or HE910) may be permanently damaged.

2.3.1.5 Audio I/O

Audio Input and Output lines are available as option. There are three lines available:

- SPK/LINE OUT – external speaker or line out
- LINE IN
- MIC IN –microphone plug

2.3.1.6 20-pin connector

RB-MTX is available with 20pin connector as an option. Detailed description is shown below.

PIN Upper row*	*Function*	*PIN* Lower row*	*Function*
1	ADC IN1	2	ADC IN2
3	DAC OUT	4	NC
5	GND (not main supply input)	6	NC
7	IN1	8	IN2
9	IN3	10	IN4
11	OUT1	12	OUT2
13	OUT3	14	OUT4
15	I2C SDA	16	I2C SCL
17	CAN L	18	CAN H
19	GND (not main supply input)	20	+3.3V output, 75mA max.

GND – ground. **Do not connect directly with minus of power supply input.**
NC – not connected

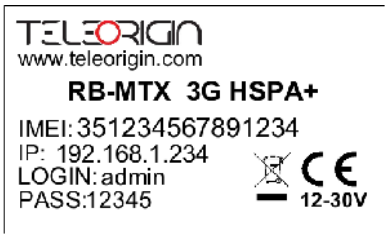
2.3.2 SIM card holders

SIM card holders are placed in front panel of RB-MTX. To insert SIM card into the extractable holder **push yellow button and take holder out**. Place SIM card as show in the picture. To operate the module in a GSM network, it is necessary to insert at least one SIM card obtained from the network operator.

2.4 Product sticker

A production sticker includes the following information:

- Product serial number
- the CE marking
- the 15-digit bar code
- the model signature (RB-MTX)



Device sticker

Box Sticker

3 Basic features and services

Basic features and available services are contained in table below.

Feature/service	Description
Standard	Supported bands: - Quad band 850/900/1800/1900/2100 MHz - 800/1800/2600 MHz in LTE variant - E-GSM compliant TX power: - 850/900 MHz Class 4 (2W) - 1800/1900 MHz Class 1 (1W) - LTE Class 3 (0.2W) - UMTS 2100 MHz Class 3 (0.25W) - EDGE 850/900 MHz Class E2 (0.5W) - EDGE 1800/1900 MHz Class E2 (0.4W) Physical size: - Max. Dimensions: 83 x 60 x 34 mm (w/ connectors) Enviromental temperature: - Min. 0°C Max. 60°C
Data features	- LTE (downlink 100 Mbit/s, uplink 50 Mbit/s) - HSPA+ (downlink 21 Mbit/s, uplink 5,76 Mbit/s) - UMTS (HSDPA 7,2 Mbit/s) - EDGE (Multi-slot class 10, max BR downlink 236,8 Kb/s) - GPRS (Multi-slot class 10, max BR downlink 85,6 Kb/s) - CSD (Max BR 14,4 Kb/s) - Embedded protocols: TCP/IP, UDP/IP, SSL, HTTP, HTTPS, FTP, SMTP, POP3, IBM MQTT - Class B GSM 07.10 multiplexing protocol
Interfaces (typical version)	- GSM antenna connector: SMA - 2x SIM Card: 3V standard - RS232 or RS485 via RJ-45 (DB9 for special use*) - RJ-45 connector (x2) - power supply connector
Options*	- Dual SIM (not in CDMA) - I/O interfaces (CAN, 3.3V output, miniUSB) - Audio I/O

*options, depending on clients needs

4 Using the modem

4.1 Setting up the modem

To set the modem, do the following steps:

4.1.1 Inserting SIM card(s)

- Push yellow button place on front panel and take SIM holder drawer out.
- Place SIM card(s) in the holder(s) as shown in the picture:

*modems are available with one or two SIM cards

4.1.2 Connecting antenna

- Connect the GSM antenna to the SMA connector, or both GSM and GPS/ZigBee in optional versions of the modem.

4.1.3 Connecting power supply cable

- Connect power supply cable into power supply connector

4.1.4 Connecting UTP cable with RJ-45

- Plug UTP or similar cable to RJ-45 plug.

4.2 Modem configuration

Modem is configured via web browser making it portable and easy to use. Modem configuration is described below in following sections. Modem settings are divided into sections which allows user to easily find option needed. When switching tabs settings are automatically saved in modem cache, to save settings permanently and apply them click Save Settings in menu. You can also discard changes by choosing appropriate option from the bottom of the menu.

WARNING: Cache is cleared on modem reset or pulling the power cable out.

WARNING: Not all tabs are available on every modem version.

4.2.1 Setting up the connection

After you connect all necessary cables (see Setting up the modem Setting up the modem) you can set up connection. Connect UTP cable to your computer and go to Internet protocol TCP/IP properties (***Network connections -> Local Area Connection ->Internet protocol TCP/IP-> Properties***) and set your IP address as 192.168.1.x. Now modem will connect your computer and its configuration page can be seen by going to default IP address in your browser **192.168.1.234**.

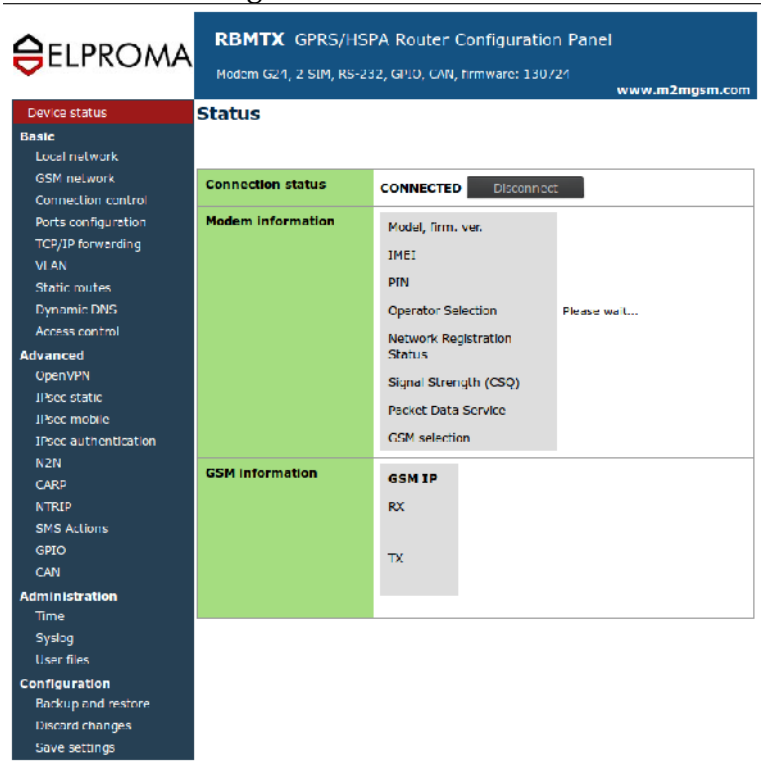
4.2.2 Modem status page

Go to your web browser and put IP address **192.168.1.234**. You will be asked for username and password. By default it is:

Username: **admin**

Password: **12345**

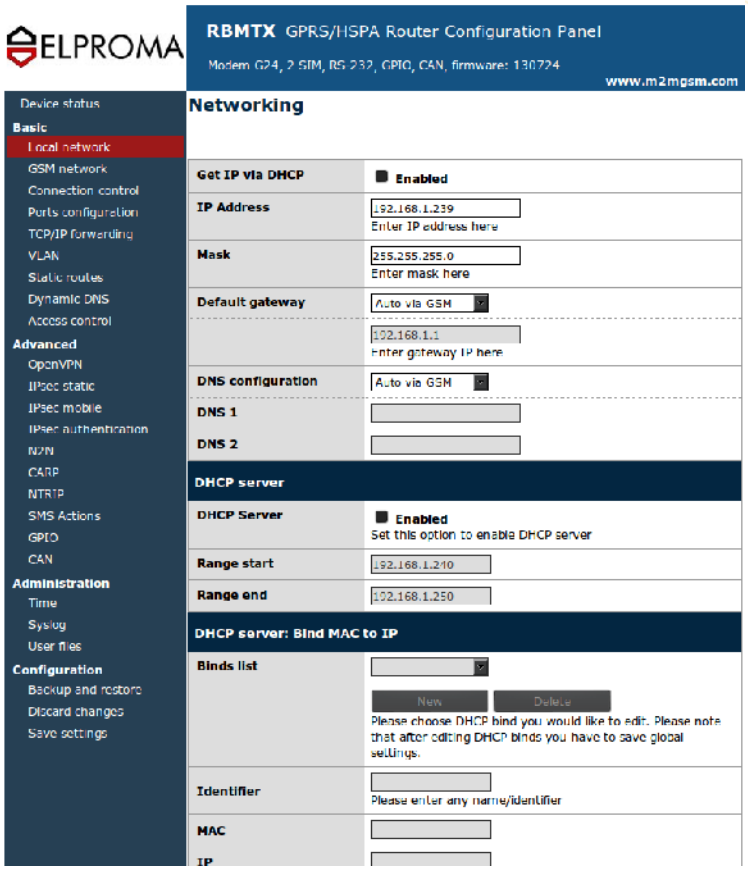
If everything is configured correctly you should see following screen:



This is Status page of your modem. Here you can see if modem is connected/disconnected from net and its parameters and parameters of PPP connection.

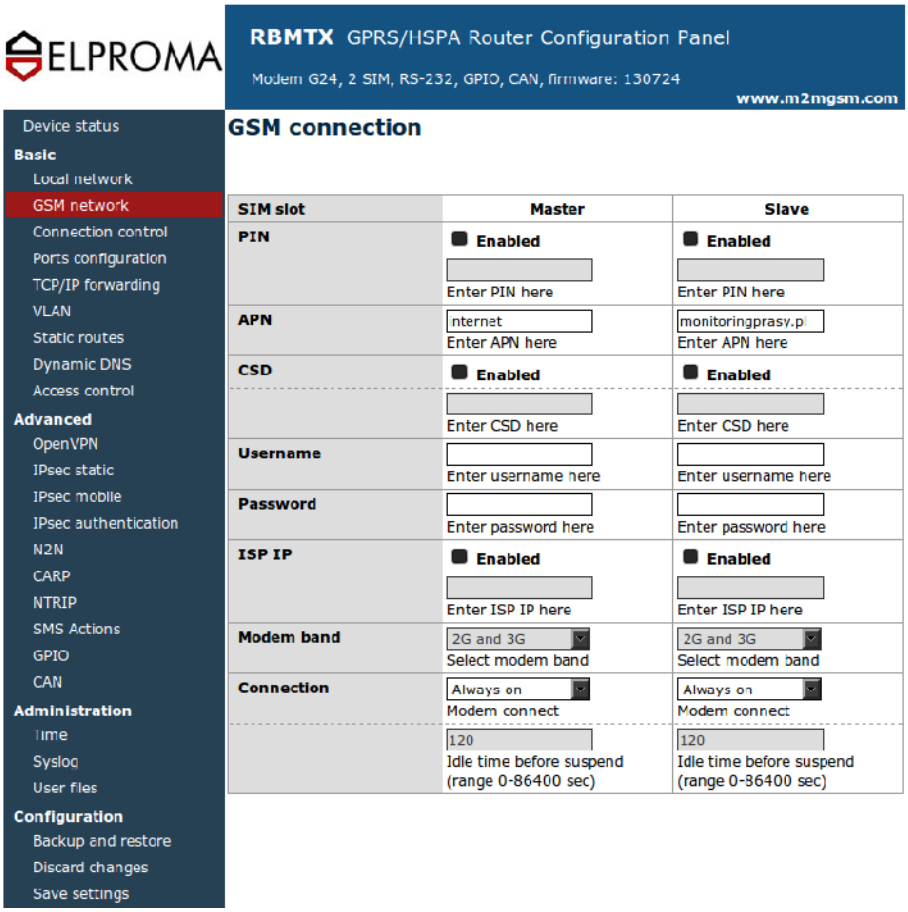
4.2.3 Local network

On LAN configuration page you can find essential parameters needed for LAN connection. Here you can set IP Address (or set it to be downloaded via DHCP), mask, default gateway, DNS addresses. Last two options can be entered manually or downloaded automatically via GSM or DHCP. Modem can also work as DHCP server-you can define its range and set list of IP-MAC binds.



4.2.4 GSM network

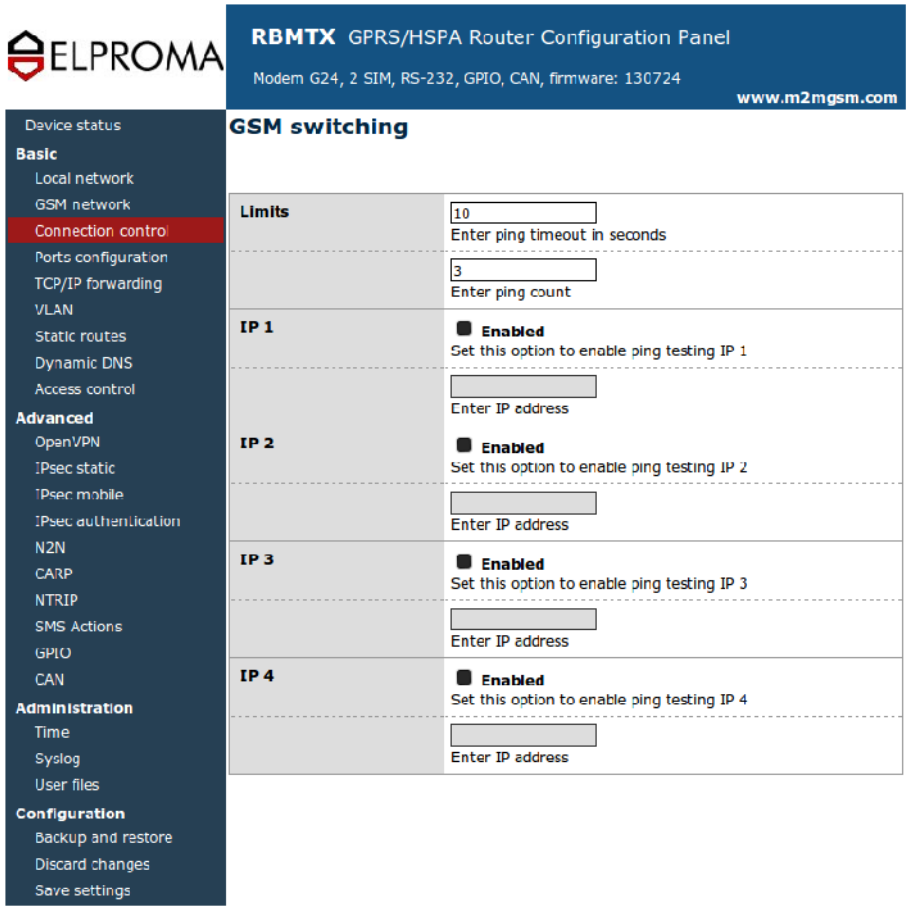
On ISP Master page you can define internet connection parameters (APN, username, password, CSD, ISP IP and Modem band) for one or two SIM cards (depending on modem version). To use internet you should know those parameters - they are essential for getting access to internet. The parameters should be ensured by your mobile network provider. You can find them by contacting your GSM network provider or visiting its website.



To enter the PIN for SIM card you need to mark “Enable” field and then fill the field below with correct PIN. Outgoing calls are made always on MASTER SIM card.

4.2.5 Connection control

Here you can set parameters of switching between two SIM cards. You can define time for ping and ping counter for 4 IP addresses you choose. In example (picture) here after 3 pings that take 10 seconds each card will change from Master to Slave or opposite.



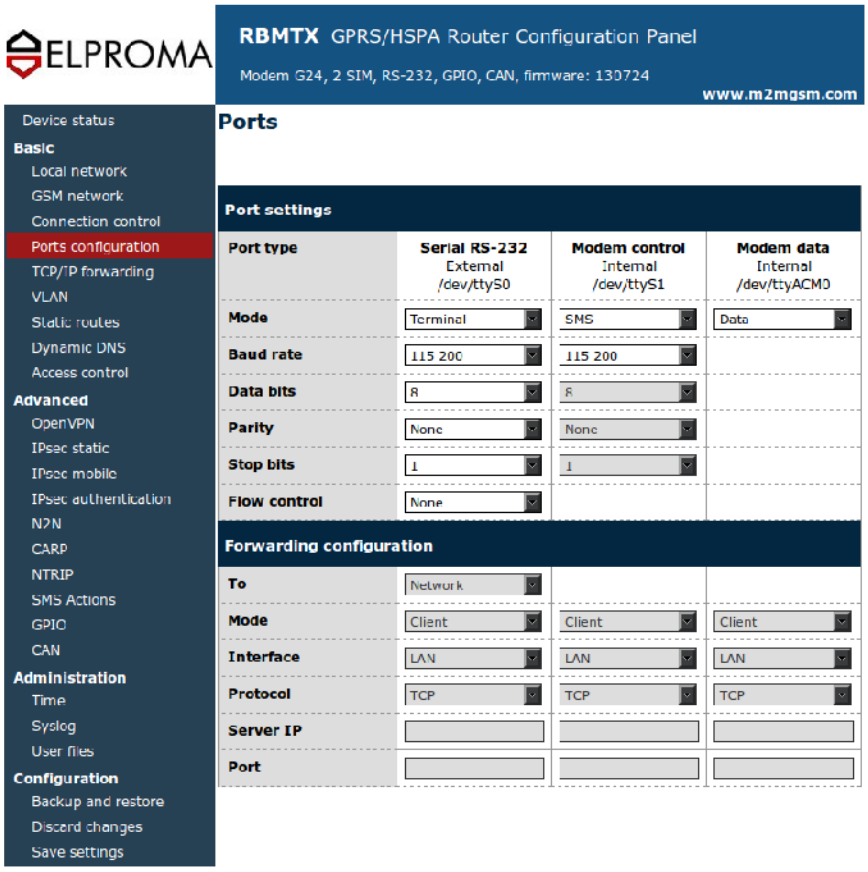
4.2.6 Ports configuration

You are able to set port settings under RS232 Port page. There are 3 configurable ports: /dev/ttyS0, /dev/ttyACM0 and /dev/ttyS1 or /dev/ttyUSB0 (depending on modem version).

Every port can be set to different mode. On /dev/ttyS0 you can set terminal, ModBus gateway or NTRIP mode. Two other ports can work as modem port (modem control and modem data) or SMS receiving port (see also: SMS Actions section).

Every port can also be set to forwarding mode that allows user to forward it to TCP/UDP port (as server or client). Port /dev/ttyS0 can also be forwarded to modem control or modem data port-in that case no other mode can be set on that port.

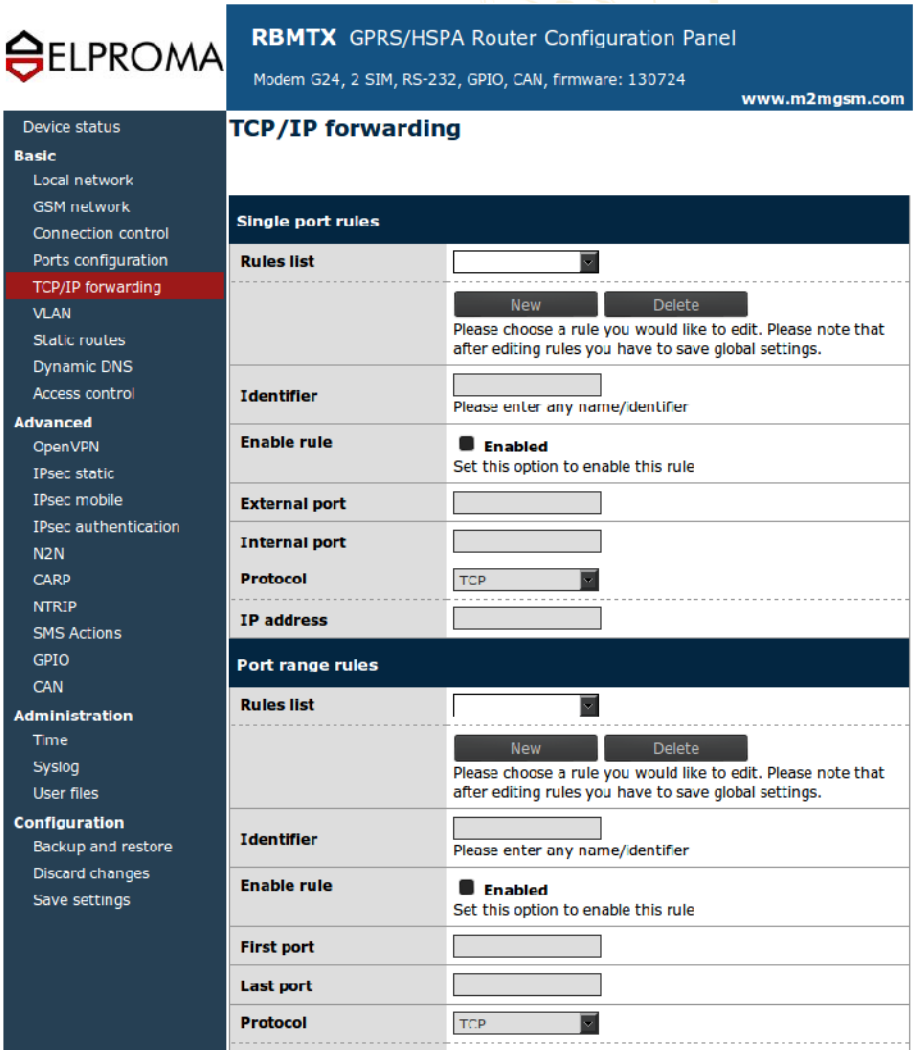
Setting certain modes on /dev/ttyS0 and /dev/ttyS1 enables setting port parameters: baud rate, data bits, parity checking and protocol. If parameter is inactive that means that user can't control it in currently set mode.



4.2.7 TCP/IP forwarding

You can forward single port or port ranges onto certain IP address To add new rule for single port, enter TCP/IP Forwarding tab. In Single port rules section click button New and enter all necessary information: identifier, check Enabled field, enter external and internal

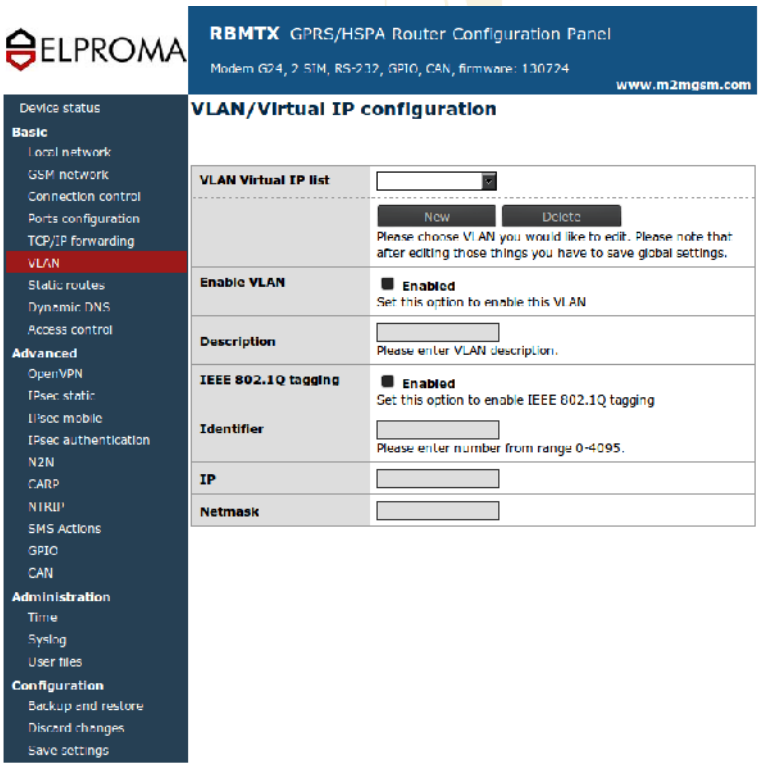
port, choose protocol (TCP or UDP) and enter IP address. When adding new rule or switching tab, currently edited rule is automatically saved. You can delete it (or any other rule) by pressing Delete button. After changes click Save Settings to save whole configuration. You can edit port range rules in the same way in Port range rules section. You can also set IP address of demilitarized zone in DMZ section.



4.2.8 VLAN

VLAN tab enables user to create virtual IP addresses. You can define IP, netmask and identifier from range 0-4095. If you enable IEEE 802.1Q tagging Virtual IP becomes part of

VLAN.

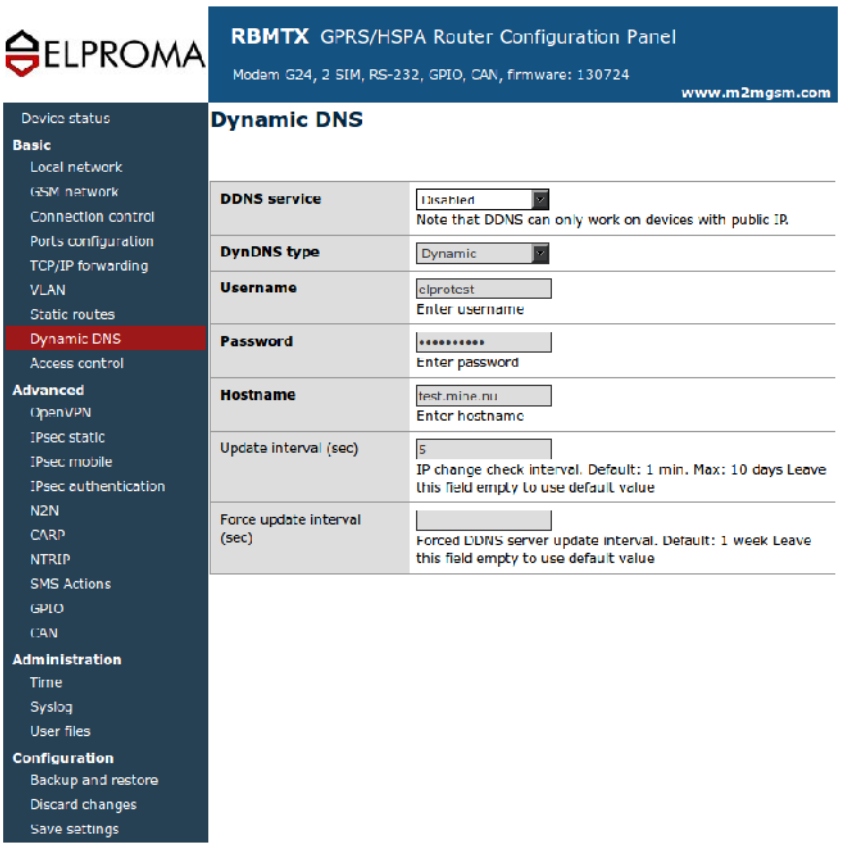


4.2.9 Static routes

Under static routes tab you can define your own routings. Please click Add new button to add new routing. Enter identifier (used only to distinguish routings in www configuration), choose interface, enter destination network, netmask and gateway.

4.2.10 Dynamic DNS

Dynamic DNS is a service which allows user to make your device available under specific www address regardless of its IP changes. In order to do that you must create an account on one of web pages that are supported by MTX modem (currently DynDNS.org or No-IP.com). After creating account, please enter necessary information in Dynamic DNS tab of www configuration: your service provider, in case of DynDNS its type, username, password, host name and two intervals. Update interval is time between two checks whether IP address had changed. Forced update interval is time between updating IP data regardless of IP change. Please last two fields empty to use default value if you're not sure what to input there.



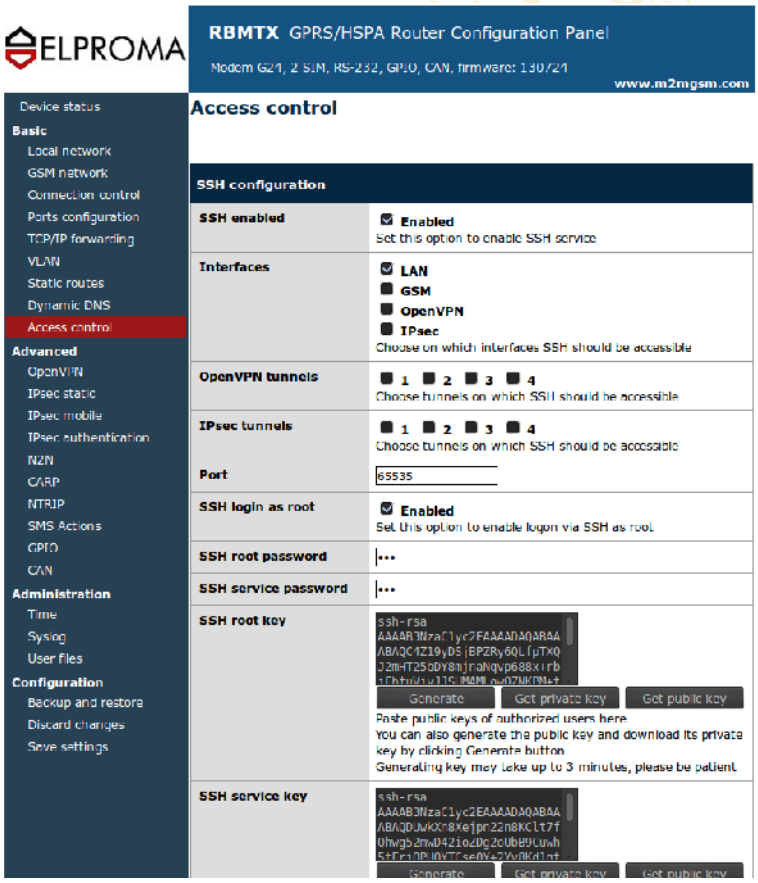
4.2.11 Access control

First section of Access Control tab allows you to configure SSH protocol. You can turn it on or off, set on which port and interfaces (also OpenVPN and IPsec tunnels) it should be accessible. You can also toggle logging via SSH as root and change/delete passwords/keys for root and service user. Remember to save whole configuration after changing password by pressing Save Configuration button from main menu. Deleting password means that it won't be needed to log on. When logging via SSH, key authentication has higher priority than password. That means that user with authorized key won't be prompted for a password and user without key will be able to login using password. You can paste multiple keys into SSH root key and SSH service key fields.

ATTENTION: Service account is used to upgrade firmware. Turning SSH off will disable firmware upgrades.

You can generate necessary keys directly on modem. Press the Generate button and wait for a while-the process can take few minutes. You should not change settings or switch

tabs then. After the generation the message will be displayed. Public key will be automatically pasted into the keys field (if the field wasn't empty before pressing the button, its contents will be saved, the newly generated key will appear first on the list). From now you will be able to download private and public keys by pressing Get private key and Get public key buttons. To login using the key under Linux, you have to download private key, change its name to id_rsa and put it in /home/user/.ssh folder.



In WWW config access section you can toggle HTTP/HTTPS access www configuration and change ports and interfaces (OpenVPN and IPsec tunnels also) on which they will be available. You can also change password for www configuration (the change will be immediate, no saving configuration is needed). For security reasons disabling both HTTP and HTTPS is not possible.

4.2.12 Open VPN

You can connect your modem to a VPN network or create your own one using OpenVPN software. It is possible to create up to four VPN connections (tunnels). To view and change settings of any of tunnels select it from Tunnel configuration list under OpenVPN tab. Then choose if modem should be server or client and connection type: tun or tap. Tun connection can be single- or multiclient. Depending on what you choose here, you will later need to enter client/server IP addresses or network and netmask.

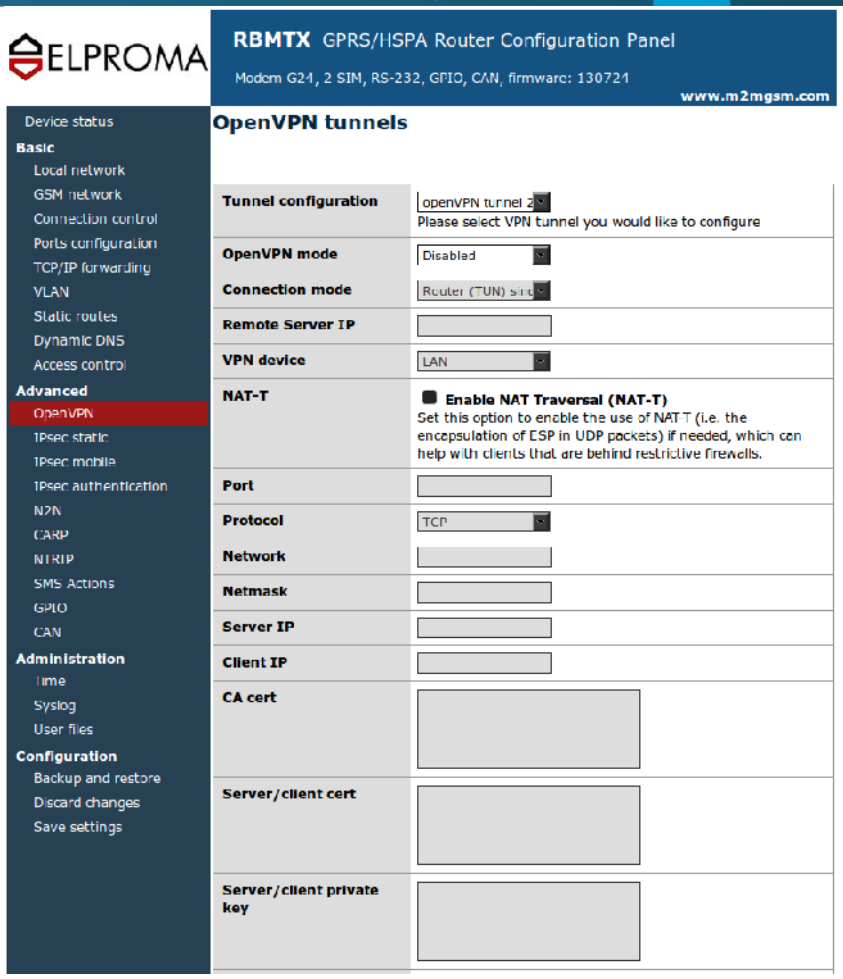
If the device should be server, please enter port on which it should listen for connections (the default VPN port is 1194, remember to open the port you chose under the firewall tab). Next, please select network device on which the connection should be held: eth (external RJ45 port) or ppp (connection via mobile network). It is also necessary to choose network protocol: TCP or UDP (use the second option if you are not sure what to choose). For tun mode user should also enter server and client IPs

(we advise you to use addresses from 10.x.x.x pool). For tap mode please enter VPN sub network address and net mask (for example 10.1.0.0 and 255.255.255.0). In most cases, your device will reserve first IP address from the pool (that is 10.1.0.1 if you are using 10.1.0.0 network).

If the device is set into client mode, in addition to settings same as those for server, you should input VPN server's IP in Remote Server IP field and its listening port in the Port field.

After filling in all necessary information user should fill in four certificate fields. The certificates should be generated on any PC (see VPN online help for more information). The contents of files should be pasted into appropriate fields of configuration. You can improve security of your VPN connection by entering TLS key into the TLS key field on every device in VPN network.

The last setting is toggling LZO compression (we advise you to enable it to improve network communication) and adding extra configuration parameters in Additional configuration field.

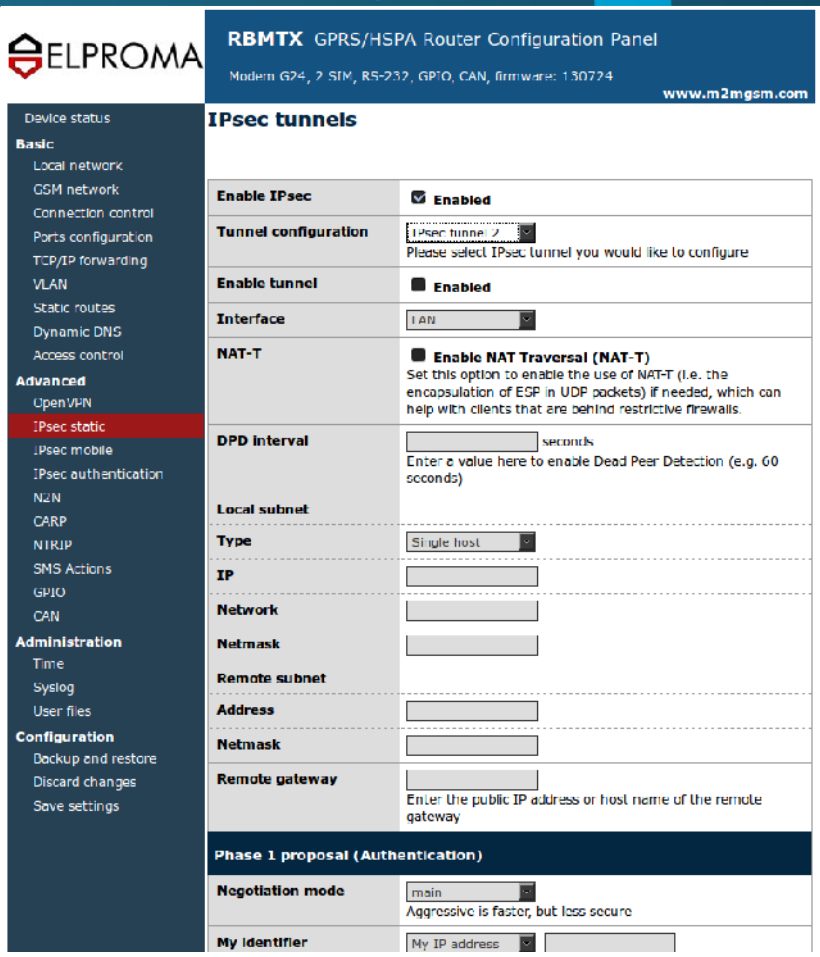

ELPROMA
RBMTX GPRS/HSPA Router Configuration Panel
Modem G24, 2 SIM, RS-232, GPIO, CAN, firmware: 130721
www.m2mgsm.com
Device status
Basic
Local network
GSM network
Connection control
Ports configuration
TCP/IP forwarding
VLAN
Static routes
Dynamic DNS
Access control
Advanced
OpenVPN
IPsec static
IPsec mobile
IPsec authentication
N2N
CARP
NTRIP
SMS Actions
GPIO
CAN
Administration
Time
Syslog
User files
Configuration
Backup and restore
Discard changes
Save settings
OpenVPN tunnels
Tunnel configuration
openVPN tunnel 2
Please select VPN tunnel you would like to configure
OpenVPN mode
Disabled
Connection mode
Remote Server IP
VPN device
LAN
NAT-T
Enable NAT Traversal (NAT-T)
Set this option to enable the use of NAT-T (i.e. the encapsulation of ESP in UDP packets) if needed, which can help with clients that are behind restrictive firewalls.
Port
Protocol
TCP
Network
Netmask
Server IP
Client IP
CA cert
Server/client cert
Server/client private key

4.2.13 Ipsec static/Ipsec mobile

IPsec is group of internet protocols that enables user to create safe connection between devices. To configure such connection on MTX modem you need to go through three tabs of configuration: Tunnels, Mobile Clients, Keys and Certificates. First of all, you need to enable IPsec under Tunnels tab. Below this option there is a combo box that enables you to switch between different tunnel configurations. If you want to enable specific tunnel, please select Enable tunnel checkbox. Then specify network interface on which the connection will be held. It is impossible to discuss all ways to create IPsec connection, so we have described sample configuration below.

Let's say we want to connect two MTX modems with following IP numbers: 123.45.67.1, 123.45.67.2. First option, DPD interval is time after which the connection is closed if the other device is not responding. You can put any value here, we will enter 3600 seconds. Then you have to choose local subnet that will be available on remote side of the connection. It can be single host, network or LAN subnet. Let's say we will be connecting more devices later so we choose network. On first modem we enter following settings: IP=192.168.36.1, Network=192.168.36.0 and Netmask=255.255.255.0. The IP must be set properly according to the network and netmask. Next step is entering remote subnet. The local subnet on first device must match remote subnet on the second device and vice versa. We have specified local subnet on second modem with following settings: IP=192.168.35.1, Network=192.168.35.0, Netmask=255.255.255.0, so on the first modem we enter following remote subnet: Address=192.168.35.0, Netmask=255.255.255.0. After specifying local and remote subnets, you should enter remote gateway which should be other device's IP. In our case we enter 123.45.67.2 on first modem and 123.45.67.1 on second one.

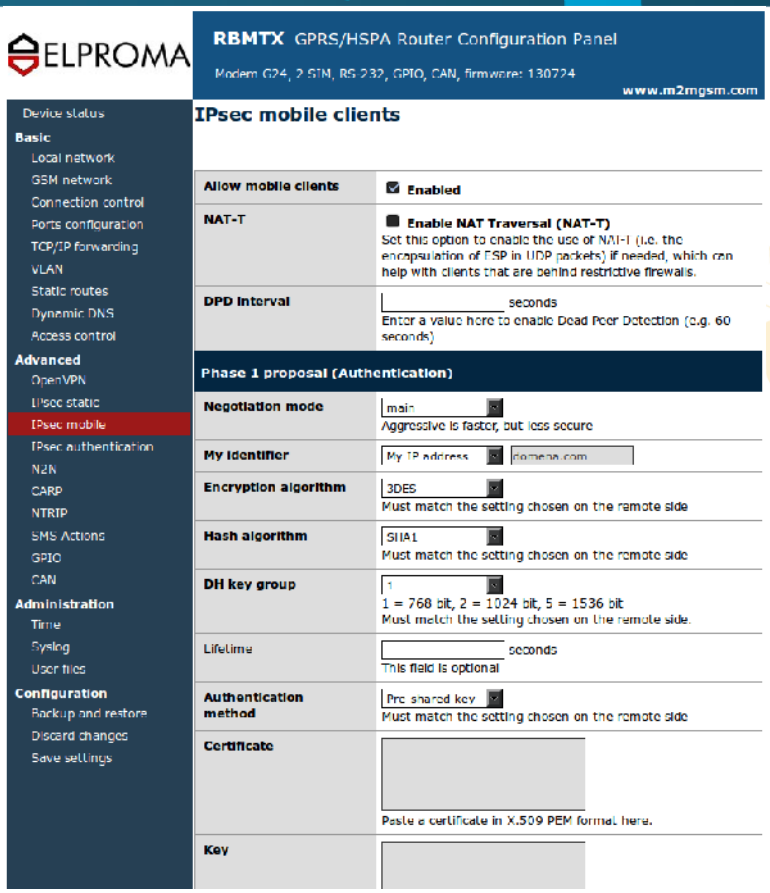
Afterwards we have to define first phase of the proposal. We choose negotiation mode-aggressive is les secure, but faster than main. Next setting is device's identifier. The most common setting is My IP address for PSK authentication and RSA Cert subject for RSA certificates. Now, please choose encryption, hash algorithm and DH key group-they must be the same on both sides of connection. Blowfish encryption is usually the fastest and AES is the slowest but most secure. You can optionally set lifetime of phase 1 or leave the field blank to use default value. The most important setting of phase 1 is choosing authentication method: Pre-shared key is like password, you have to enter the same key on both sides. More sophisticated authentication method is using RSA certificates, but you need to generate certificate and key for every device. You have two options here: either input other device's certificate in Peer certificate field or add CA certificate (we will cover that topic later).



In the second phase of proposal please specify the protocol (ESP is authentication with encryption, AH is authentication only), encryption algorithm, hash algorithm and PFS key group. Please note that you can choose multiple algorithms, but at least one should match on both sides of the connection. The last setting is phase 2 lifetime (leave field empty for using default value).

After configuring all settings remember to save configuration. The configuration of IPsec connection is finished unless you chose to authenticate with RSA certificates and CA certificate. In that case click on Keys and Certificates tab. Here you can add multiple Pre-shared keys and CA certificates. Adding both is similar, so we will explain only adding CA certificates. To add new one, please click on Add new button. Specify Identifier (which is used only for distinguish them in www configuration), paste CA certificate and certificate revoke list. Last field is optional and lets you ban users that shouldn't be allowed to join your network anymore.

IMPORTANT: After filling in fields click Save button and then save whole configuration by clicking Save settings. If you want to delete certificate, choose it from the list, click Delete button and then save whole configuration.



It is possible to create IPsec connection with non-static-IP-devices. In order to do this please click Mobile clients tab. Configuration is similar to the tunnel configuration, but there are less settings (for example there is no PSK field-you should add pre-shared keys for mobile clients in Keys and Certificates tab).

IMPORTANT: When configuring IPsec connection you will sometimes want to add custom routing. This topic is covered in next section.

4.2.14 Generating SSL certificates

In order to use SSL authentication creating few files and copying them into adequate fields under OpenVPN or IPsec tabs of www configuration is needed. This can be done using PC with Linux and openssl installed. There is also Windows version of software available at **http://gnuwin32.sourceforge.net/packages/openssl.htm**.

At first we need to create folder, in which all our keys and certificates will be stored. Let's say it will be ~/keys. We create two files in it: list of certificates and file enumerating them:

touch index.txt
echo 00 > serial

and subdirectories, where the certificates and keys will be stored:

mkdir private certs newcerts crl

In order to create certificates, the certificate authority (CA) is needed . It is „main'' certificate used to create other certificates. After creating private CA key:

openssl genrsa -des3 -out private/cakey.pem 1024

Warning: please remember the CA password!

The CA certificate is generated:

openssl req -new -x509 -days 365 -key private/cakey.pem -out cacert.pem

When creating a certificate user has to provide some information like country, state/province, city, company name, e-mail address and common name. The last field is most important, it has to be unique for every device.

After creating CA certificate generation of certificate for every device used is needed.

At first the private key is generated:

openssl genrsa -des3 -out private/device1key.pem

Then we generate certificate request:

openssl req -new -key private/device1key.pem -out device1req.pem

Here user has to enter country, state etc. again. They can be the same as before except the common name.

Certificate authority signs the certificate:

openssl ca -notext -in device1req.pem -out device1cert.pem

If certificate will be used on MTX modem, password on private key has to be disabled:

openssl rsa -in private/device1key.pem -out private/device1key.pem_nopass

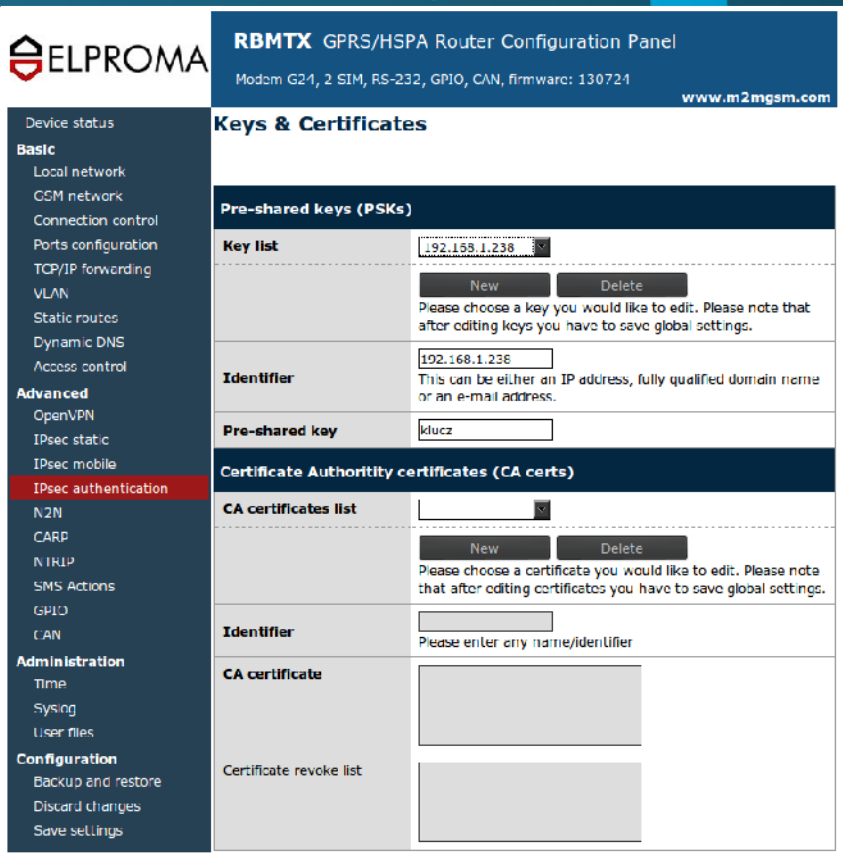
The whole process is repeated for every device (unique common names and filenames have to be unique for different devices!).

If IPsec protocol will be used, certain fields in www configuration under Ipsec/Tunnels tab have to be filled in. Content of *device1cert.pem* file should be pasted into the Certificate field and contents of *device1key.pem_nopass* into the Key field. Peer Certificate field can be filled with another device's certificate file or left empty. In this case the CA certificate has to be provided under Keys and Certificates tab. Contents of *cacert.pem* file should be inserted there.

If the OpenVPN protocol will be used, under OpenVPN tab content of *cacert.pem* has to be pasted into CA cert field, content of *device1cert.pem* into Server/Client cert field and *device1key.pem_nopass* into Server/Client private key field. The Diffie- Hellman parameters file has to be created for VPN connection:

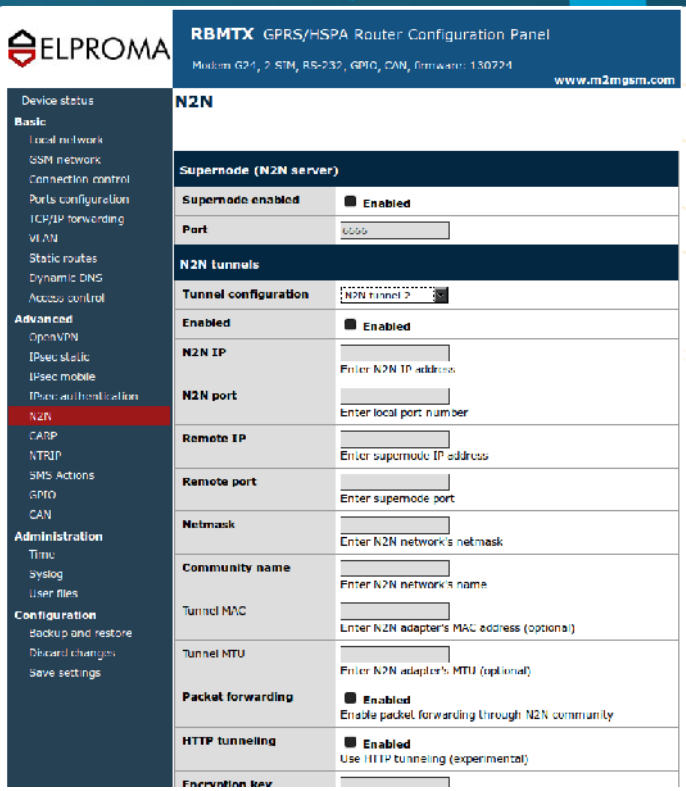
openssl dhparam -out dh1024.pem 1024

And its content should be copied into DH PEM field. This file is common for all devices in VPN network.



4.2.15 N2N

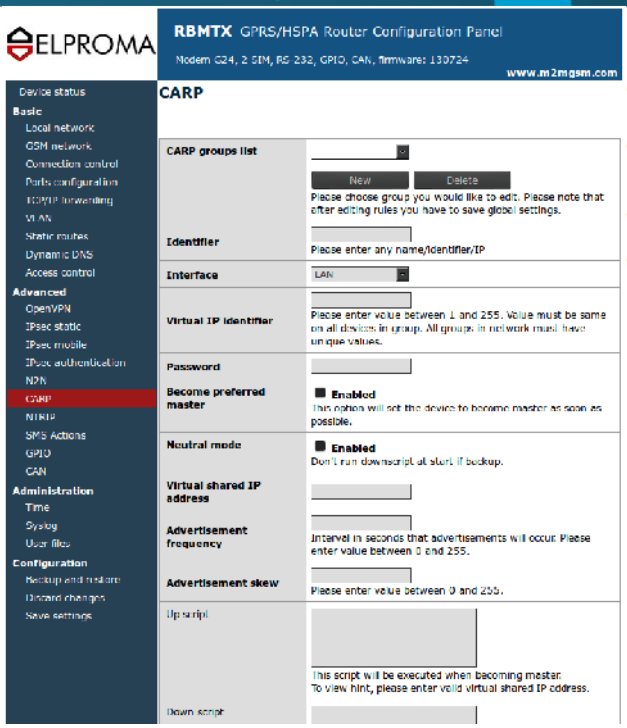
N2N is application that enables user to create secure subnetworks like OpenVPN and IPsec, but it is based on P2P connections. User can configure modem to host N2N server (just enable the option and choose port on which it will be available) and up to four tunnels. To configure tunnel choose N2N IP address, local and remote port, netmask and remote IP address. You have to input community name and key (all members of N2N network should have same community name and key. Rest of parameters should be used only by experienced users.



4.2.16 CARP

CARP is a network protocol that allows many devices to be connected into redundancy group which will be available as one device on chosen network address. For example you can choose devices that have IPs 192.168.1.2 and 192.168.1.3 to be available on 192.168.1.115. If one device will stop working, the other one will serve users at shared address. Device that is currently active on shared address is called master and other devices are called backup.

If you want to configure CARP, please choose network interface on which CARP client will be available and choose group identifier that will be same on all devices in group-it has to be number from 1 to 255. Enter virtual shared IP address. Advertisement frequency and skew regulate how often devices will be contacting each other. Remember to define up script and down script that will set/delete routings when becoming master/backup.

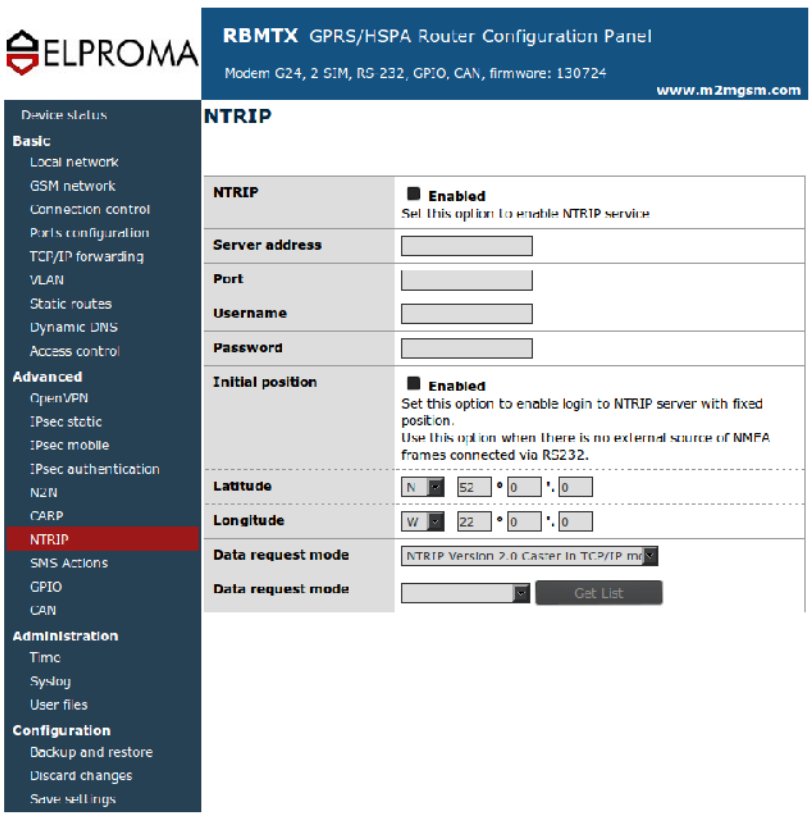


4.2.17 NTRIP configuration page

One of /dev/ttyS0 port modes is communication with external device using NTRIP protocol. If you decide to use it, it is necessary to set the mode under RS232 Port configuration page. Then, enter settings in NTRIP page. Server address, port and initial position fields are necessary. Username and passwords are optional.

It is also possible to choose data request mode. After entering required data, please click Get List button to download data streams list from the server – it may take a while, please be patient. After downloading the list please select one of data streams.

Attention: Entering initial position is necessary to login to NTRIP server if no external device sending NMEA frames is connected to the S0 port.



4.2.18 SMS Actions

SMS Actions tab allows user to define shell scripts that will be executed every time modem receives SMS with specified content.

To enable this option ensure that global SMS Actions checkbox is enabled and you have set one of available ports into SMS receiving mode under Ports configuration tab. Then click New button, enter any identifier and command-sms content that will trigger action. You can write any shell script you want and/or set GPIO action to be executed.

4.2.19 GPIO

Settings under GPIO tab in www configuration enable user to configure external input and output GPIO ports. When switching tab to GPIO current pin states is read automatically into eight fields in upper section of the webpage. In whole configuration the following convention is used: the unchecked field represents low state and checked field represents high state. Successful read of GPIO pins states is indicated by „OK'' status. In case of error „ERROR!'' is displayed. If pins state update is needed, please click Refresh button.

To set initial states of output pins use checkboxes 11,12,13 and 14. They are set when the modem is powered up and when the GPIO configuration is changed and saved.

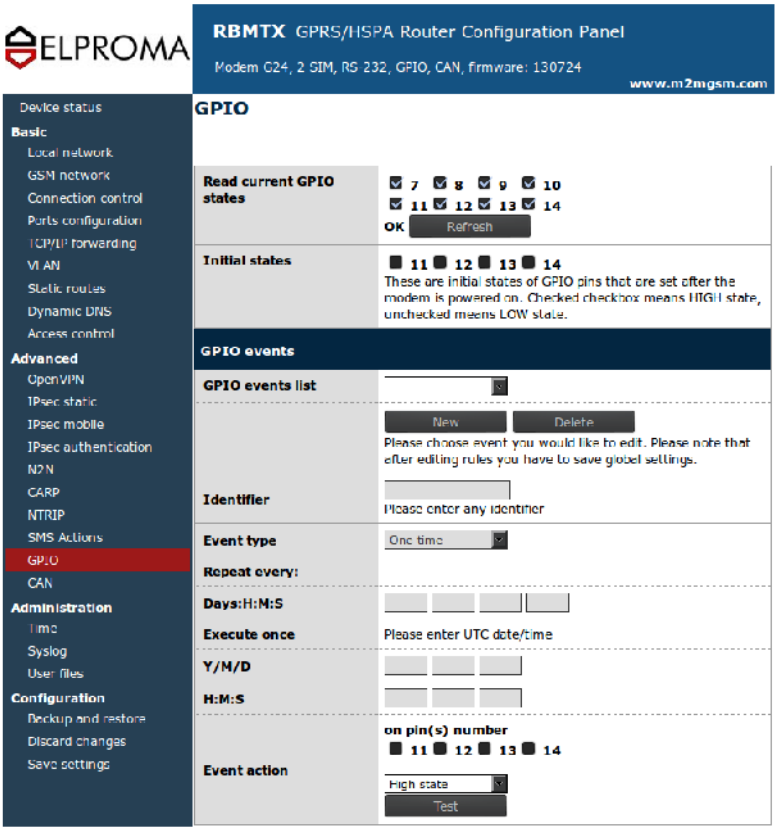
Section GPIO events allows user to create unlimited number of events on which the state of output pins will be changed. In order to create a new event, click New button and then fill out all necessary fields. The identifier is used to distinguish events. It can be any character string. The event type determines if an event is executed only once (One time) or with determined frequency (Regular). In case of one time event enter UTC date and time of the

event. Make sure that real time clock is set correctly on the device. In case of regular event specify time interval between two [consecutive] event executions. Finally choose pin or pins used for the event and what action should be taken (setting high state, setting low state or switching states). Let's assume pins 11,13 was selected and action set to „Set HIGH state". As result at entered time of the event high state will be set on pins 11,13 and on pins 12,14 no action will be taken (previous state will be preserved). An event execution can be also directly tested by clicking Test (current GPIO states will be refreshed automatically).

There is also a possibility to manually operate GPIO pins using HTTP GET `<device ip>/actions/gpio_action.php` request. The following parameters can be used:

Parameter	Accepted values
cmd	readall, read, write
pins	Any combination of pins 7-14 separated by commas
state	H, L, I, S (high, low, input, switch states)

The readall command requires no additional parameters. However, read and write requires setting pins parameter. write requires setting state parameter. Please keep in mind that you are not able to set state on input pins. Parameters should be provided in webpage address after '?' character typical for complex GET requests. Parameter and its values are separated with = character, i.e. „parameter=value" . Each pair of parameter and value are separated from another with & character (see examples).



Examples of usage are shown below.

Prints current state of all ports:

```
192.168.1.234/actions/gpio_action.php?cmd=readall
```

Prints current state of physical output number 14:

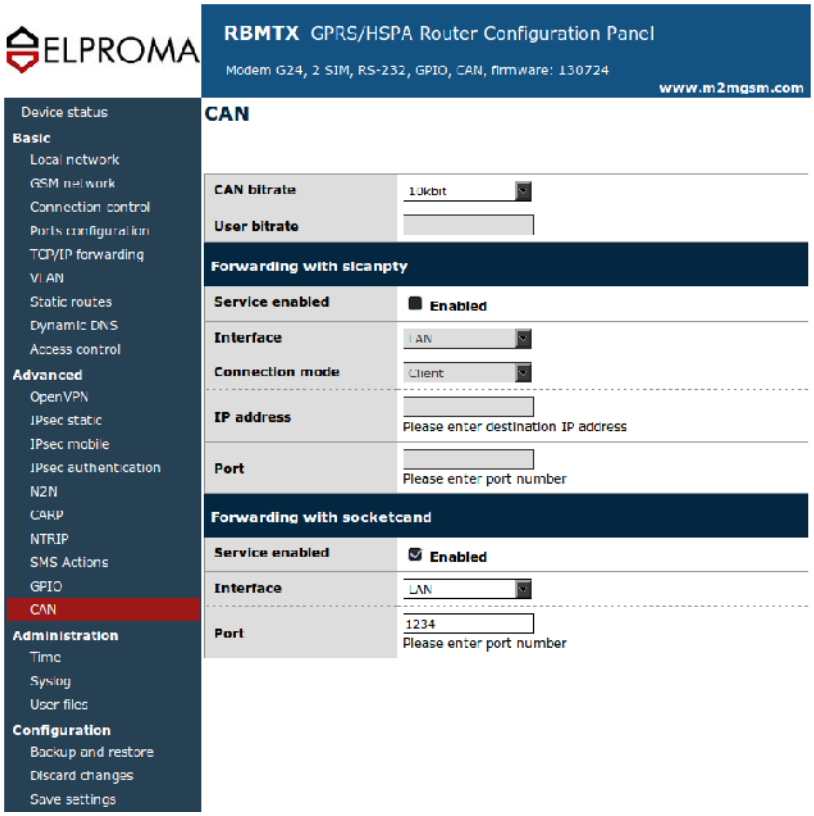
```
192.168.1.234/actions/gpio_action.php?cmd=read&pins=14
```

Sets low state on physical outputs number 11 and 12 (On successful execution no text is printed):

```
192.168.1.234/actions/gpio_action.php?cmd=write&pins=11,12&state=L
```

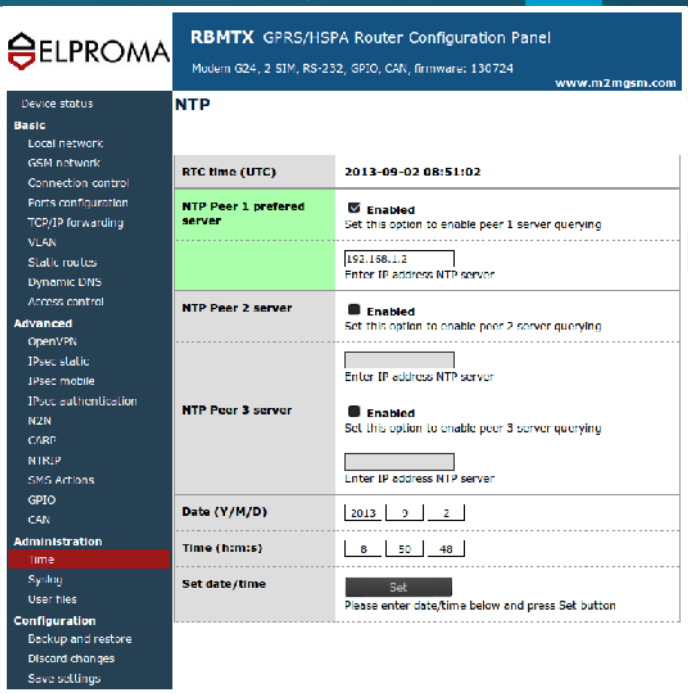
4.2.20 CAN

If you have modem with CAN interface you can configure it under CAN tab. You can set the baudrate and set forwarding CAN frames to TCP using slcanpty or socketcand.



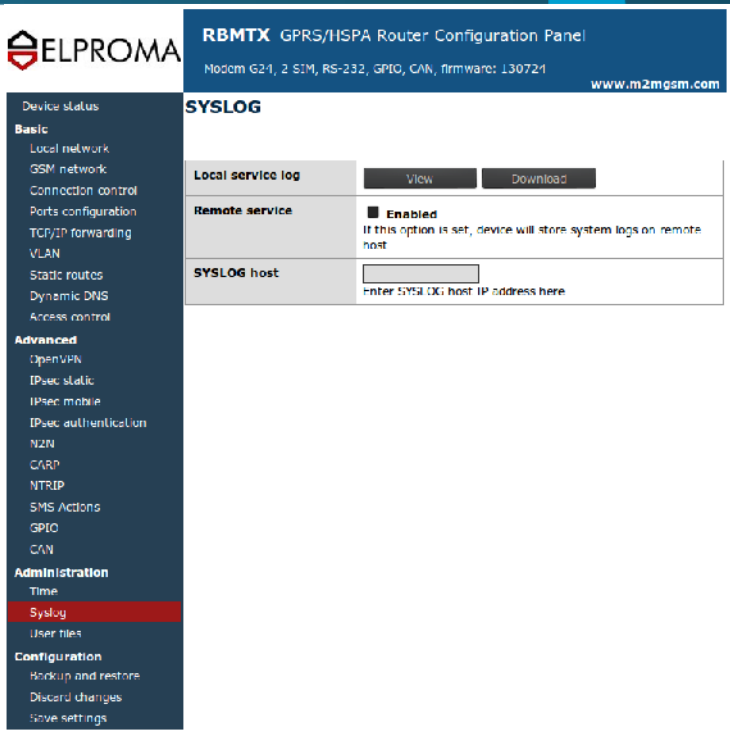
4.2.21 Time

Here you can manually set hardware clock or input IP of NTP server to synchronize time automatically



4.2.22 Syslog

Here you can define how modem should save your logs. Modem has internal memory that get overwritten when it reaches its end. You can also save logs on your computer by clicking download (manually). It is also possible to get remote access to logs by enabling Remote service and setting SYSLOG host.



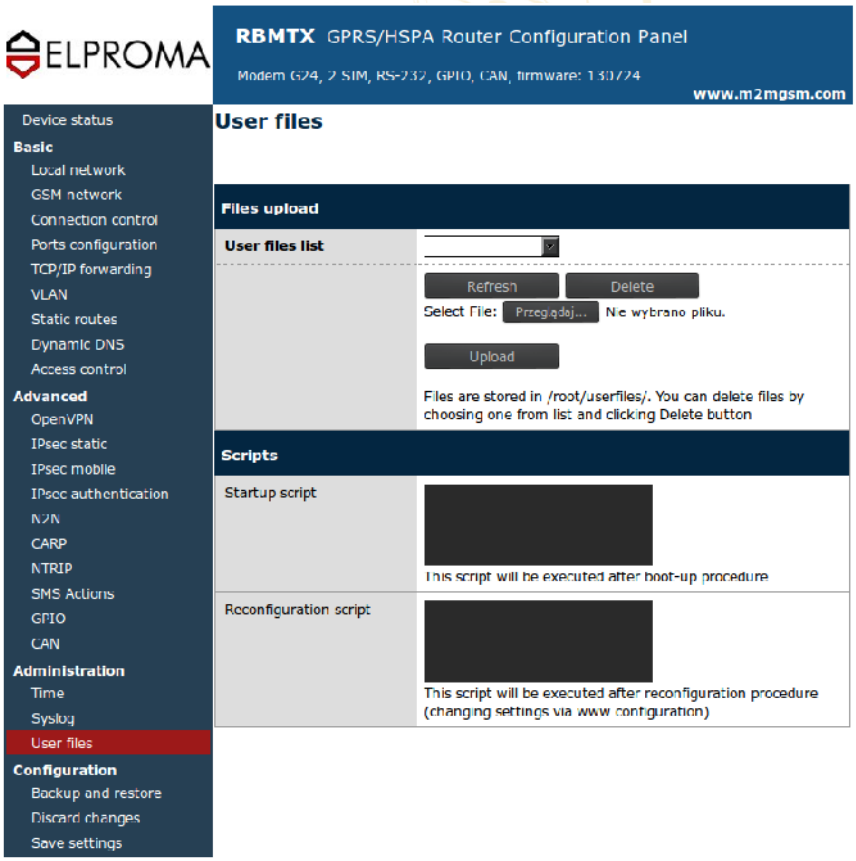
4.2.23 User files

You can upload to the modem your own scripts and executable files and set them to be used in certain situations (e.x. when the VPN connection is established or at modem startup). Under User files tab there is a list of user files. It is refreshed automatically after selecting tab, it can be also manually refreshed by pressing Refresh button. To delete file, select it from the list and press Delete button. To upload file, click Upload new button. You will be redirected to separate site. Choose file by pressing Browse... button and commit your choice by clicking Upload. After upload you will be informed if the whole operation was successful or the error message will be displayed. Use link to return to the main page of www configuration. All files are stored with rights for file execution, so they can be used in scripts.

Below the file upload panel there are two fields, where you can write scripts. Startup script will be executed after startup procedure of modem and Reconfiguration script every

time you click Save Configuration button in www configuration. You can write your scripts in Bash or PHP, but remember to use special header for scripts ((#!/bin/bash lub #!/usr/bin/php). You can execute uploaded user files, they are stored in /root/userfiles.

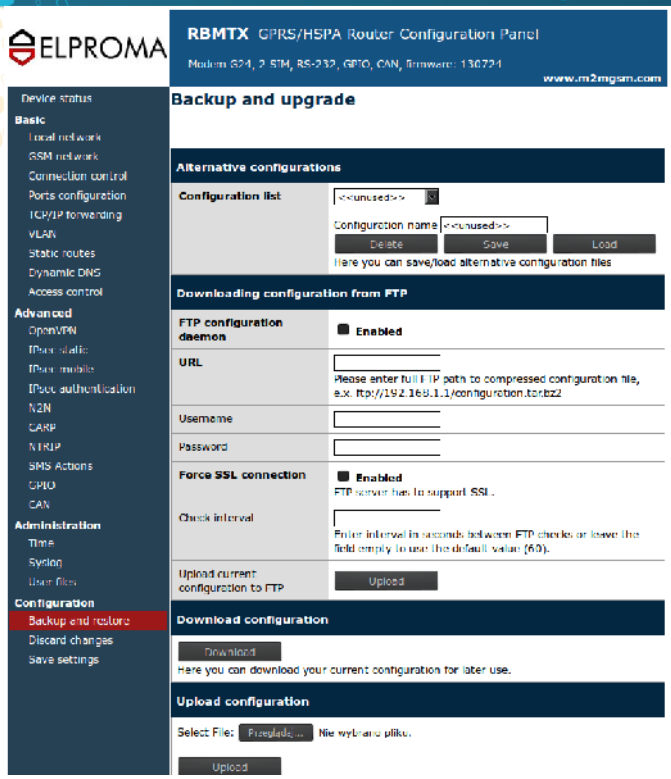
WARNING: Binary files uploaded to modem should be compiled for processor installed in modem!



4.2.24 Backup and restore

Under backup and restore tab user can:

- Save/load alternative configurations
- Configure FTP client to periodically check FTP server for latest configuration
- Download/Upload backup configuration



4.2.25 Discard changes

Discard current changes in configuration which were not saved yet.

4.2.26 Save settings

To save your settings click save setting and wait until message will show up to confirm your configuration data was saved.

4.3 System logs description

This paragraph shows structure of typical System log with some basic errors:

01/01/0000:00:30 rbmtx syslogd 1.4.1: restart.
01/01/0000:00:31 rbmtx Start: RBMTX - G24 FIRM:120312 – **modem and firmware info**
01/01/0000:00:35 rbmtx supervisor[560]: SIM Holder open/closed – **SIM holder open/closed by software**
01/01/0000:00:36 rbmtx supervisor[560]: Modem init 1 – **first initialization try**
01/01/0000:01:09 rbmtx supervisor[560]: Init /dev/ttyS1 – **port initialization**
01/01/0000:01:10 rbmtx supervisor[560]: Init /dev/ttyACM0
01/01/0000:01:13 rbmtx supervisor[560]: Modem is not registered on the GSM network – **modem is not able to log into network**
01/01/0000:01:13 rbmtx supervisor[560]: Entering Modem is ready

01/01/0000:01:13 rbmtx supervisor[560]: Entering PIN OK – **modem is ready for connection**
01/01/0000:01:13 rbmtx supervisor[560]: Entering PIN error code: - **wrong PIN message**
01/01/0000:01:14 rbmtx login[811]: unable to change tty `/dev/ttyS0' for user `root'
01/01/0000:01:14 rbmtx login[811]: ROOT LOGIN on `ttyS0'
01/01/0000:01:20 rbmtx pppd[901]: pppd 2.4.5 started by root, uid 0 – **connection**
01/01/0000:01:21 rbmtx chat[903]: timeout set to 2 seconds
01/01/0000:01:21 rbmtx chat[903]: send (AT)
01/01/0000:01:21 rbmtx chat[903]: expect (OK)
01/01/0000:01:21 rbmtx chat[903]: AT
01/01/0000:01:21 rbmtx chat[903]: OK
01/01/0000:01:21 rbmtx chat[903]: send (ATZ0)
01/01/0000:01:21 rbmtx chat[903]: expect (OK)
01/01/0000:01:21 rbmtx chat[903]: ATZ0
01/01/0000:01:21 rbmtx chat[903]: OK
01/01/0000:01:21 rbmtx chat[903]: send (AT)
01/01/0000:01:21 rbmtx chat[903]: abort on (NO DIALTONE)
01/01/0000:01:21 rbmtx chat[903]: abort on (ERROR)
01/01/0000:01:21 rbmtx chat[903]: abort on (NO ANSWER)
01/01/0000:01:21 rbmtx chat[903]: abort on (BUSY)
01/01/0000:01:21 rbmtx chat[903]: expect (OK)
01/01/0000:01:21 rbmtx chat[903]: AT
01/01/0000:01:21 rbmtx chat[903]: OK
01/01/0000:01:21 rbmtx chat[903]: send (ATZ0)
01/01/0000:01:21 rbmtx chat[903]: abort on (NO CARRIER)
01/01/0000:01:21 rbmtx chat[903]: timeout set to 30 seconds
01/01/0000:01:21 rbmtx chat[903]: expect (OK)
01/01/0000:01:21 rbmtx chat[903]: ATZ0
01/01/0000:01:21 rbmtx chat[903]: OK
01/01/0000:01:21 rbmtx chat[903]: send (AT)
01/01/0000:01:21 rbmtx chat[903]: expect (OK)
01/01/0000:01:21 rbmtx chat[903]: AT
01/01/0000:01:21 rbmtx chat[903]: OK
01/01/0000:01:21 rbmtx chat[903]: send (AT+CGDCONT=1,"ip","example.apn")
01/01/0000:01:22 rbmtx chat[903]: clear abort on (ERROR)
01/01/0000:01:22 rbmtx chat[903]: send (dddATD*99#)
01/01/0000:01:23 rbmtx supervisor[560]: pppd check loop:1
01/01/0000:01:25 rbmtx chat[903]: expect (CONNECT)
01/01/0000:01:25 rbmtx chat[903]: AT+CGDCONT=1,"ip","example.apn"

4.4 Firmware update

This chapter describes in few steps how to make upgrade of your modems firmware.
Actual number of your modems firmware can be found here: ***http://x.x.x.x/firmware.php***
where *x.x.x.x* is ip adres of your modem (by default it is 192.168.1.234).
You need following files for upgrade and test your upgrade:

- plink.exe (putty)
- pscp.exe (putty)
- service.key (private key)
- servicekey.ppk (private key generated for putty)
- upgrade.bat (upgrade scrypt)
- upload_img.bat (copy .bin file to modem scrypt)
- upgrade_20110301.bin (name depends on upgrade date)

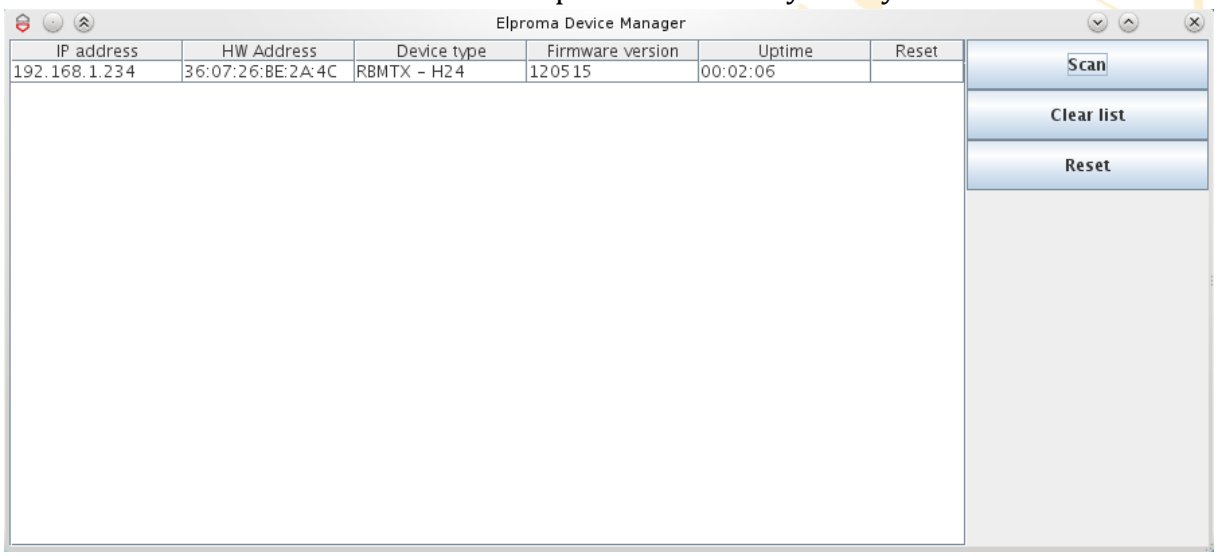
Follow next steps to upgrade your firmware:

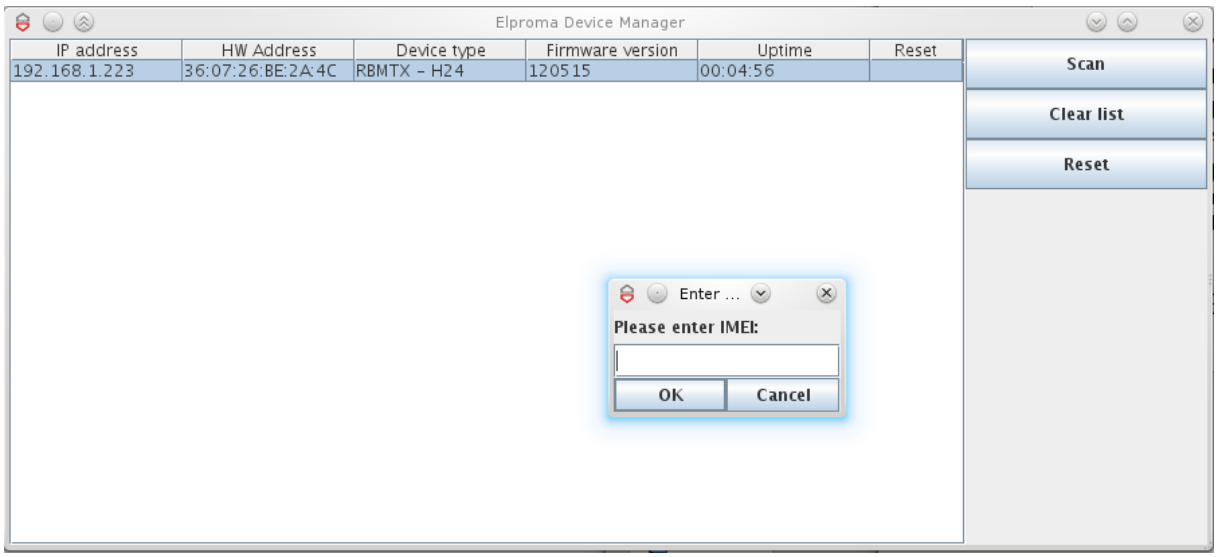
- To start upgrade you need first to upload file upgrade_20110301.bat on your modem to do this start file upload_img.bat with parameters: file and ip of modem.
  upload_img.bat upgrade_20101001.bin 192.168.1.234
  Can be done directly in Windows OS (remember about ':' sign in the end)
  pscp -scp -i servicekey.ppk -P 65535 service@192.168.1.234:
  In Linux OS it should be similar:
  scp -i service.key -P 65535 upgrade.bin service@IP:
- You can start upgrade procedure by starting file
  upgrade.bat 192.168.1.234
  or on Windows OS:
  plink -ssh -i servicekey.ppk -P 65535 service@192.168.1.234 upgrade
  and on Linux OS:
  ssh -i service.key -p 65535 service@192.168.1.234 upgrade
- You can also use commands like reboot, delusblog, help, for example to reboot system:
  plink -ssh -i servicekey.ppk -P 65535 service@192.168.1.234 reboot

4.5 Elproma Device Manager

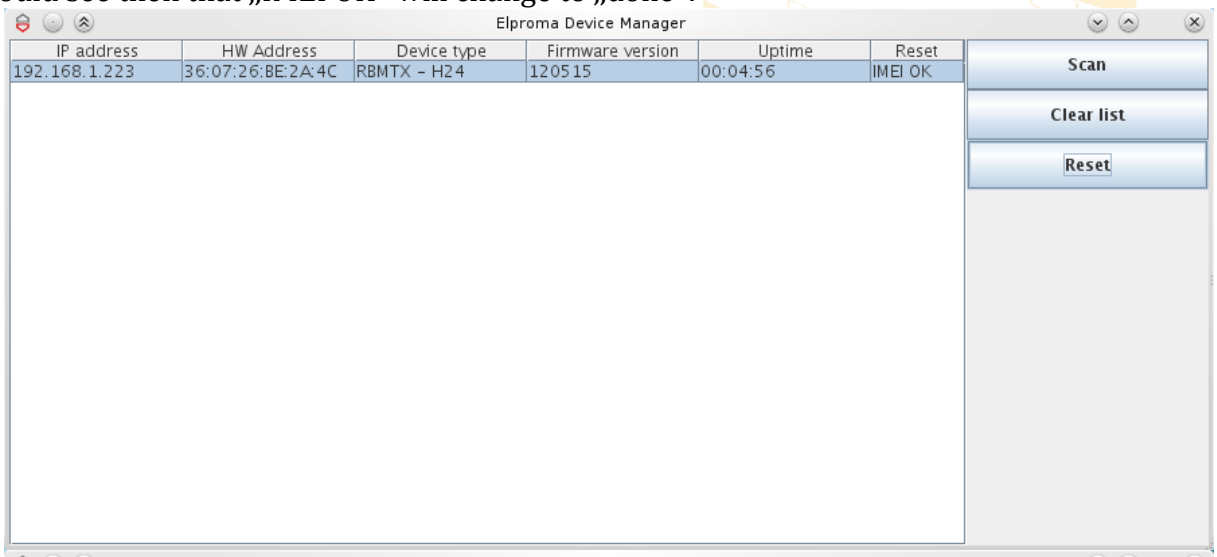
Elproma Device Manager is an application which allows you to find RB MTX modems in local area network (LAN) and then restore factory settings by entering their IMEI number. It is particularly useful when you forgot IP number of device and you can't access it by terminal on serial port.

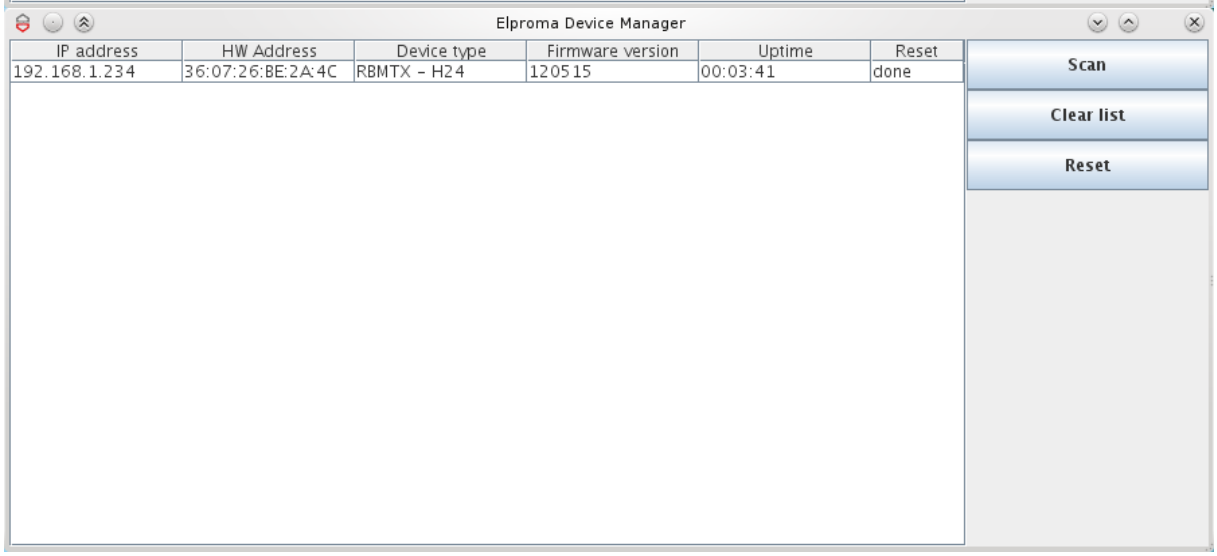
The installation process is pretty simple-you launch .exe file and choose path where to unpack the application. The main window of program consists of table-list of devices available on your network and buttons: Scan, Clear List, Reset and About. First you need to scan the network for devices. It takes few seconds to list all the devices. Please also keep in mind that it takes a while to boot modem so it won't respond immediately after you turn it on.





When the scan is complete you can see list of available devices in the table. You can review information like IP address, MAC address, device name, firmware version and uptime. If you want to restore factory settings on any device on the list, click the Reset button and enter IMEI. Program will send special packet to all devices, but only the one with IMEI you have entered will be affected. If the IMEI is correct and the factory settings have been restored you should see „IMEI OK'' in one of cells of last column. This device will now reset to load new settings and after about 1-2 minutes it will confirm that whole operation was successful - you should see then that „IMEI OK'' will change to „done''.





5 Troubleshooting

5.1 No communication with the modem

If there is no communication with the modem do the following steps:

- Check all external connections of the modem
- Verify if power supply is correct
- Check if TCP/IP parameters are correct
- Check if any firewall is not blocking connection with the modem

5.2 Modem answers but there is no internet connection

If there is no internet connection do following:

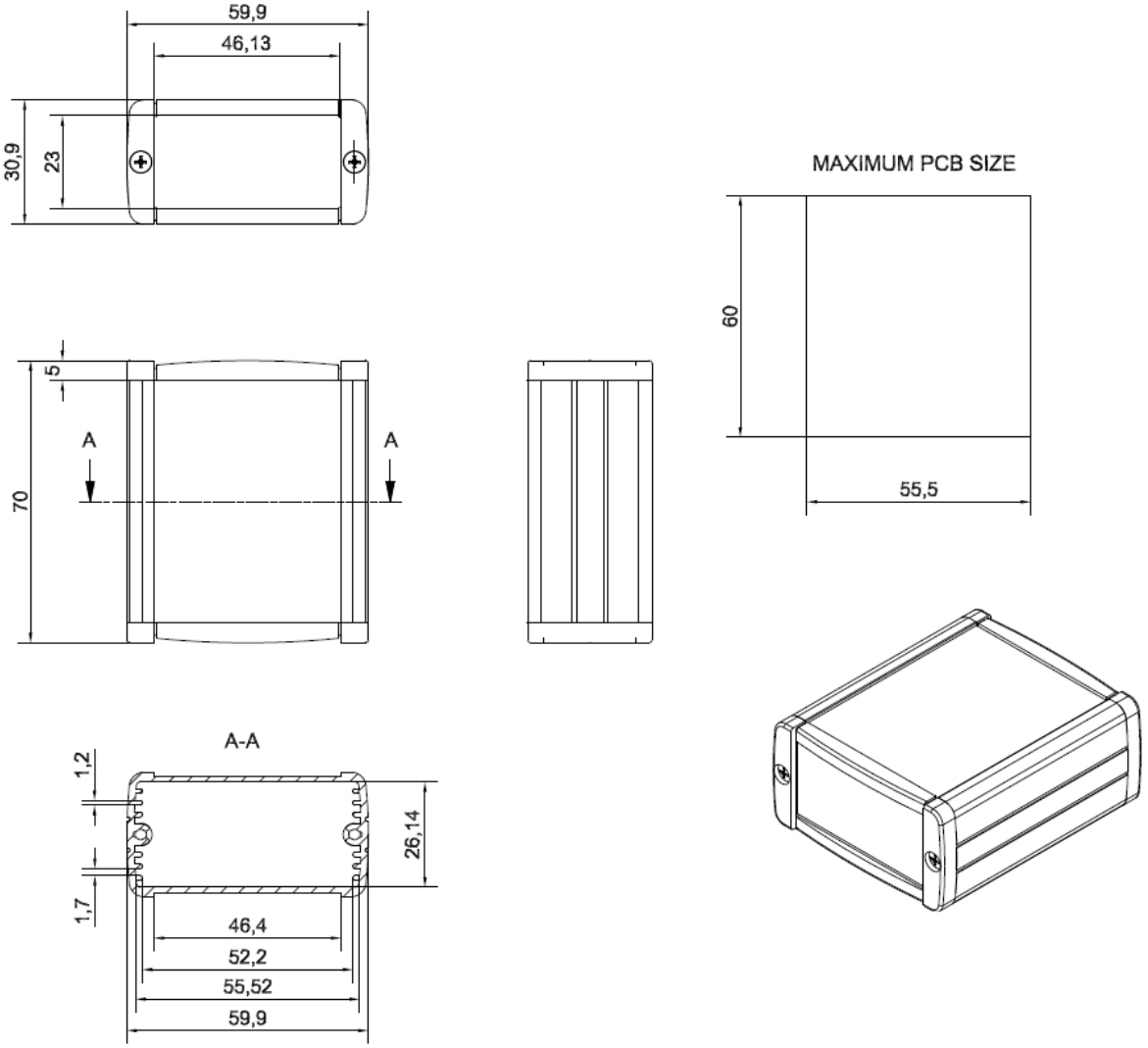
- Check if antenna is connected properly
- Check if you have reception of GPRS/EDGE/HSPA signal in your area (on website of GSM provider
- Check if you configured your modem with proper parameters provided by your network provider (they should match in order to connect to internet)
- In case you do not have internet access contact your provider in order to get internet access

6 Technical characteristics

6.1 Mechanical characteristic

Max. dimensions	70 x 59,9 x 30,9 mm (w/o connectors) 80 x 59,9 x 30,9 mm (w/ connectors)
Weight	≈138,3 g (only modem w/o any external connection) ≈145,7g (modem w/ antenna)
Volume	≈129,56 cm3 (w/o connectors)

6.2 Housing (dimension diagram)



6.3 Electrical characteristic

6.3.1 Power supply

- Nominal voltage range: 6V..30V
- Maximum continuous (average, depends on supply voltage) supply current: +800 mA max
- Peak (momentary) supply current: 2 A

6.3.2 RF characteristics

6.3.2.1 Frequency ranges

Range depends on the module that is used in your version of device and type of network you choose to use.

Parameter	Conditions	Specifications
GSM 850	TX	824 – 849 MHz
	RX	869 – 894 MHz
GSM 900	TX	880 – 915 MHz
	RX	925 – 960 MHz
DCS 1800	TX	1710 – 1785 MHz
	RX	1805 – 1880 MHz
PCS 1900	TX	1850 – 1910 MHz
	RX	1930 – 1990 MHz
IMT 2100	TX	1920–1980 MHz
	RX	2110–2170 MHz

6.3.2.2 RF performance

Minimum radiated RF performance is shown in the table below:

Band		850/900	1800/1900
GSM/GPRS	TRP [dBm]	22	24,5
	TIS [dBm]	-99	-101,5
EGPRS	TRP [dBm]	20,5	19,5
	TIS [dBm]	-92,5	-93,5

6.3.2.3 External antenna

The external antenna is connected to the modem via SMA connector.
Antenna must have parameters as shown below in table.

Antenna frequency range	Dual-band GSM 900/DCS 1800 MHz
Impedance	50 Ω
DC impedance	0 Ω
Gain	0 dBi w/o cable; 2dBi w/ cable
VSWR (with cable)	-10 dB

The antenna chosen for working with modem should best fit to circumstances of environment it is used in. When the modem is placed in a room or somewhere where the range of networks signal is too low, the outdoor or specific indoor antenna should be used to increase it.

6.4 Environmental characteristic

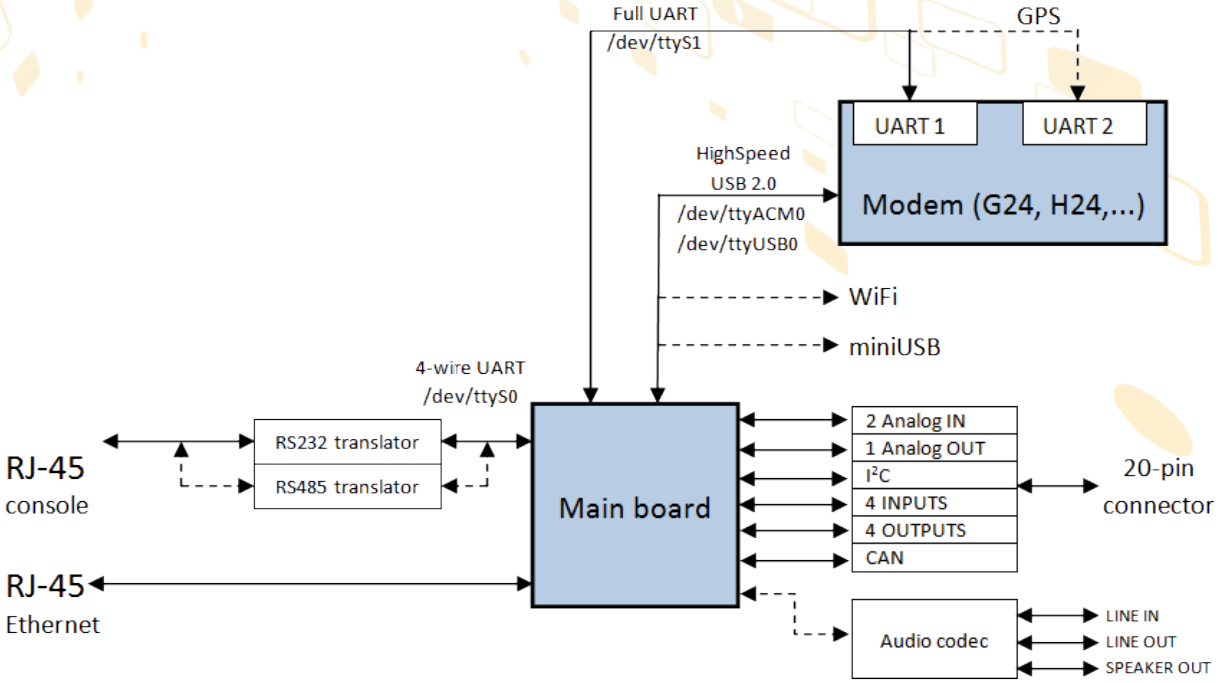
Table below gives the environmental operating conditions of the G24 Java module (same as terminal).

Attention! Exceeding the values may result in permanent damage to the module.

Parameter	Conditions	Min	Max	Unit
Ambient Operating Temperature		-20	60	°C
Storage Temperature		-40	85	°C
ESD	At antenna connector Contact Air At interface connector		 ± 6 ± 15 ± 1	KV

7 Terminal architecture

Diagram below shows simplified architecture of RB-MTX. Features marked with dotted lines are available as option.



8 Safety recommendations

8.1 General Safety

Please follow safety regulations regarding the use of radio equipment due to the possibility of radio frequency interference. Read given advices carefully.

Switch ***off*** GSM terminal when:

- in an aircraft – using cellular telephones in aircraft may endanger the operation of the aircraft; it is illegal
- at a refuelling point
- in any area with potentially explosive atmosphere which could cause an explosion or fire
- in hospitals and any other places where medical equipment is in use

Respect restrictions on the use of radio equipment in any area or place where it is signalized that using cellular telephony is forbidden or dangerous.

Using GSM modem close to other electronic equipment may also cause interference if the equipment is inadequately protected. It may lead to damage or failure of GSM modem or the other equipment.

8.2 Care and Maintenance

The RB-MTX terminal is a electronic product that should be treated with care. Please follow suggestions shown below due to using modem for many years.

- Do not expose terminal to any extreme circumstances like high temperature or high humidity
- Do not keep modem in dirty and dust places
- Do not disassemble the modem
- Do not expose the modem to any water, rain or steam
- Do not drop, shake or knocking your modem
- Do not place your modem close to magnetic devices – credit cards, etc
- Use of third party equipment or accessories, not made or authorized by Elproma Electronics may invalid the warranty of modem and/or cause failure or permanent damage of modem
- Do not expose the modem to children under 3 years

8.3 Responsibility

The modem is under your responsibility. Please treat it with care, and respect local regulations. This is not a toy – keep it out of the reach of children.

Try to use security features (PIN etc.) to block unauthorized use or theft.

9 Accessories

The tables below shows recommended accessories for RB-MTX terminal.

9.1 Accessories critical for using modem

Table below shows accessories critical for using modem. Without them usage of modem is impossible.

Accessory	Description	Part no.
Power adaptor	6V ... 30V	PS6V1500MA
Antenna	-	ANTDBSMRSMA

9.2 Additional accessories

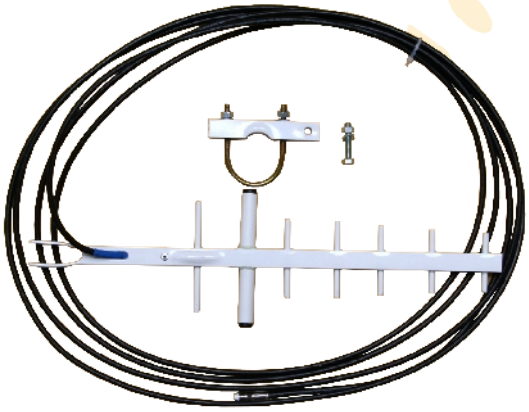
Table below shows additional accessories that are not essential for modem usage, but can be useful or needed.

Accessory	Description	Part no.
Directional antenna (1)	Directional antenna for GSM900	AK 5GSM/X
Directional antenna (2)	Directional antenna for GSM1900	AK 7/DCS-UMTS/10
Omnidirectional antenna (1)	Omnidirectional antenna	AK PN
Omnidirectional antenna (2)	Omnidirectional antenna	AK C1
Power cable – open end	-	?
IO cable	-	?
RS232/485 cable	-	?
DIN rail holder	-	?
Bur holder	-	?

9.2.1 Directional antennas

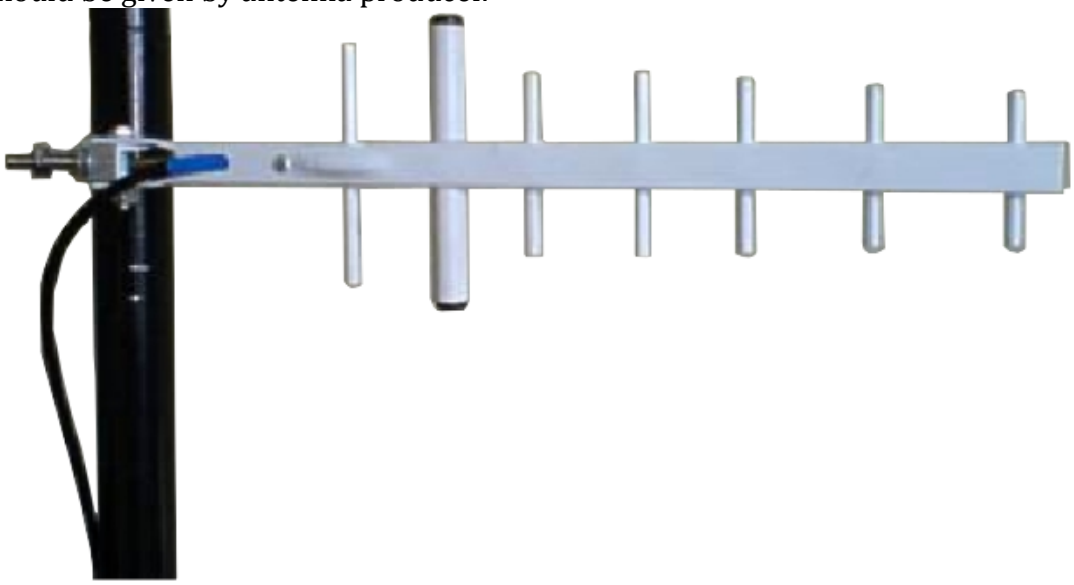
Use directional (outdoor or indoor) antennas if signal range is too low or very low. Directional antenna can increase signal level. Using the antenna cannot guarantee sufficient range of signal – it depends on GSM coverage in place where modem is used. It is better to use an antenna which works in higher frequency (GSM1900), but it depends on if GSM1900 signal is transmitted in area of use – if not use antenna for lower frequency (GSM900). If there is no GSM signal any antenna would help.

Directional antenna AK 5GSM/X



Directional antenna AK 7/DCS-UMTS/10

It is possible that there is no signal in buildings the antenna in that cases can be mounted on the roof or in a room where signal is sufficient. The antenna can be mounted on an **aerial mast** (as shown in pictures below) or in other ways. All instructions of mounting an antenna should be given by antenna producer.



If directional antenna is connected by FME connector (shown in picture) You can use FME – SMA converter:

FME – SMA converter

FMA connector male

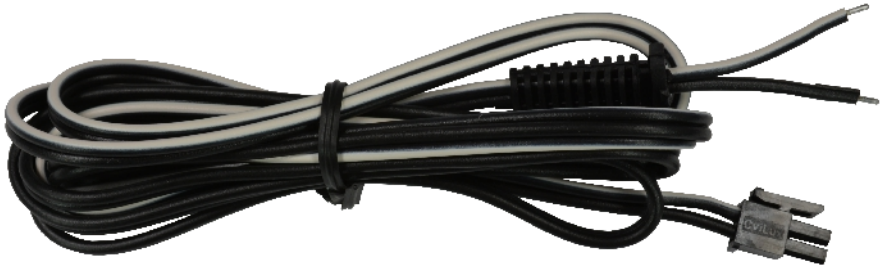
9.2.2 Omnidirectional antennas

In case of weak coverage you can also use omnidirectional antennas. The signal gain of omnidirectional antenna is lower than directional antenna. Still, in most cases this is enough to get proper reception. You can use magnetic base or wall handle antennas, they differ in way of mounting – see pictures below.

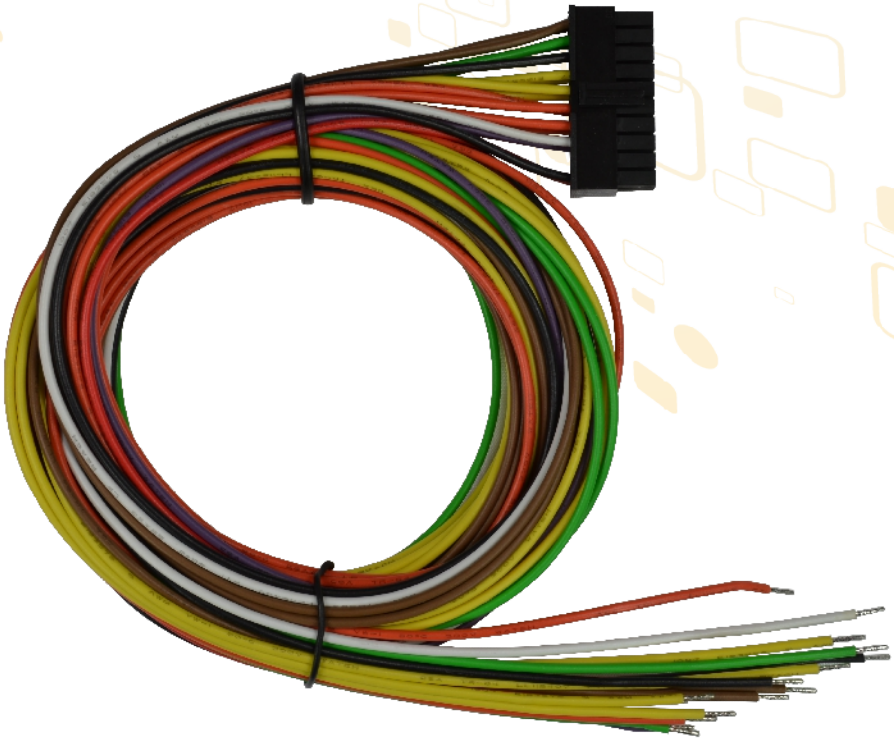
AK PN antenna with magnetic base

AK C1 antenna with wall handle

9.2.3 Powr cable – open end



9.2.4 IO cable



9.2.5 RS232/486 cable

9.2.6 DIN rail holder

9.2.7 Bur holder

10 Conformity Assessment Issues

The Telit GT864-3Ghas been assessed in order to satisfy the essential requirements of the R&TTE Directive 1999/05/EC (Radio Equipment & Telecommunications Terminal Equipments) to demonstrate the conformity against the harmonised standards with the final involvement of a Notified Body.

CE

11 Safety Recommendations

READ CAREFULLY

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and has to be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, aircrafts, etc
- Where there is risk of explosion such as gasoline stations, oil refineries, etc

It is responsibility of the user to enforce the country regulation and the specific environment regulation.

Do not disassemble the product; any mark of tampering will compromise the warranty validity.

We recommend following the instructions of the hardware user guides for a correct wiring of the product. The product has to be supplied with a stabilized voltage source and the wiring has to be conforming to the security and fire prevention regulations.

The product has to be handled with care, avoiding any contact with the pins because electrostatic discharges may damage the product itself. The same cautions have to be taken for the SIM, checking carefully the instruction for its use. Do not insert or remove the SIM when the product is in power saving mode.

The system integrator is responsible of the functioning of the final product; therefore, care has to be taken to the external components of the module, as well as of any project or installation issue, because the risk of disturbing the GSM network or external devices or having impact on the security. Should there be any doubt, please refer to the technical documentation and the regulations in force.

Every module has to be equipped with a proper antenna with specific characteristics. The antenna has to be installed with care in order to avoid any interference with other electronic devices and has to guarantee a minimum distance from the people (20 cm). In case of this requirement cannot be satisfied, the system integrator has to assess the final product against the SAR regulation.

12 List of Acronyms

ACM	Accumulated Call Meter
ASCII	American Standard Code for Information Interchange
AT	Attention commands
CB	Cell Broadcast
CBS	Cell Broadcasting Service
CCM	Call Control Meter
CLIP	Calling Line Identification Presentation
CLIR	Calling Line Identification Restriction
CMOS	Complementary Metal-Oxide Semiconductor
CR	Carriage Return
CSD	Circuit Switched Data
CTS	Clear To Send
DAI	Digital Audio Interface
DCD	Data Carrier Detected
DCE	Data Communications Equipment
DRX	Data Receive
DSR	Data Set Ready
DTA	Data Terminal Adaptor
DTE	Data Terminal Equipment
DTMF	Dual Tone Multi Frequency
DTR	Data Terminal Ready
EMC	Electromagnetic Compatibility
ETSI	European Telecommunications Equipment Institute
FTA	Full Type Approval (ETSI)
GPRS	General Radio Packet Service
GSM	Global System for Mobile communication
HF	Hands Free
IMEI	International Mobile Equipment Identity
IMSI	International Mobile Subscriber Identity
IRA	Internationale Reference Alphabet
ITU	International Telecommunications Union
IWF	Inter-Working Function
LCD	Liquid Crystal Display

LED	Light Emitting Diode
LF	Linefeed
ME	Mobile Equipment
MMI	Man Machine Interface
MO	Mobile Originated
MS	Mobile Station
MT	Mobile Terminated
OEM	Other Equipment Manufacturer
PB	Phone Book
PDU	Protocol Data Unit
PH	Packet Handler
PIN	Personal Identity Number
PLMN	Public Land Mobile Network
PUCT	Price per Unit Currency Table
PUK	PIN Unblocking Code
RACH	Random Access Channel
RLP	Radio Link Protocol
RMS	Root Mean Square
RTS	Ready To Send
RI	Ring Indicator
SAR	Specific Absorption Rate (e.g. of the body of a person in an electromagnetic field)
SCA	Service Center Address
SIM	Subscriber Identity Module
SMD	Surface Mounted Device
SMS	Short Message Service
SMSC	Short Message Service Center
SPI	Serial Protocol Interface
SS	Supplementary Service
TIA	Telecommunications Industry Association
UDUB	User Determined User Busy
USSD	Unstructured Supplementary Service Data

13 On-line support

Elproma provides a range on on-line support which includes:

- the latest version of this document
- the latest drivers for RB-MTX
- technical support

This information can be found on our web sites at www.elproma.com.pl or www.teleorigin.com.

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